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Estimating the Constraints to Trade of Developing Countries

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Abstract

ESTIMATING THE CONSTRAINTS
TO TRADE OF DEVELOPING COUNTRIES

by

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The severity of binding constraints to trade expansion in developing countries and the importance of the complementary policies that will maximize the impact of trade reforms on trade and economic growth are identified and quantified in this report. As trade-related needs of developing countries are numerous, such quantification is needed to identify the most binding constraints to guide the sequencing of reforms and aid-for-trade interventions. The constraints to trade expansion are largely country specific. However, countries which share important characteristics may face similar binding constraints. An econometric analysis is undertaken for as many partner countries as possible to produce an "unrestricted sample" that can be used as a benchmark against which special country groupings can be assessed. The econometric work relies on experimentation to identify and rank (based on their relative severity) the most binding constraints for each country grouping. Two case studies, on Azerbaijan and Uganda, illustrate the mechanisms of the econometric work and the importance of several variables not captured because of data limitations

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Executive Summary

Building on the conclusions of the reports "Binding Constraints to Trade Expansion: Aid for Trade Objectives and Diagnostics Tools" (Hallaert and Munro, 2009) and "Increasing the Impact of Trade Expansion on Growth: Lessons from Trade Reforms for the Design of Aid for Trade" (Hallaert 2010), this report tries to identify and quantify the severity of binding constraints to trade expansion in partner countries as well as the importance the complementary policies that are paramount in maximizing the impact of trade reforms on trade and economic growth. As developing countries trade-related needs are numerous, such quantification is needed to identify the most binding constraints and thus guide the sequencing of reforms and aid-for-trade interventions. Despite its importance, to the best of our knowledge no such work has been yet undertaken in the literature.

This report looks at four main questions relevant to the discussion on implementation and effectiveness of Aid for Trade.

- How severe are the various possible constraints to trade expansion?

- How different are the constraints to imports and the constraints to exports?

- What impact would addressing these constraints have on trade and on economic growth?

- To what extent would the answer to these three previous questions differ for landlocked countries, small and vulnerable economies, and commodity exporters?

The constraints to trade expansion are largely country specific. However, countries which share important characteristics may face similar binding constraints. An econometric analysis is undertaken for as many partner countries as possible these to produce an "unrestricted sample" that can be used as a benchmark against which special country groupings can be assessed. The econometric work does not try to test a theoretical model, but relies on experimentation to identify and rank (based on their relative severity) the most binding constraints for each country grouping. Two case studies, on Azerbaijan and Uganda, illustrate the mechanisms of the econometric work and the importance of several variables not captured because of data limitations.

Several conclusions emerge from the benchmark (unrestricted sample) results.

- In line with economic literature, both imports and exports boost economic growth, but the constraints to exports differ from those applicable to imports. This finding has many policy implications, the most important being that trade reform should focus not only on export promotion but also on the role of imports. Moreover, it confirms the fact that in promoting trade expansion, Aid for Trade contributes to economic growth in developing countries.

- Despite recent trade liberalization, a cut in import tariffs can still boost export and import performance, but the impact is small compared to other constraints.

- Electricity appears to be the main constraint to trade expansion. The constraint is less related to availability than to reliability.

- In contrast, transportation problems constrain trade performance more through the availability of infrastructure than through its quality.

- Access to credit is also a significant barrier to trade but only for imports.

- The results confirm the importance of complementary and compatible policies (education, governance, business environment, and macroeconomic stability) as very important to trade expansion and economic growth as they affect factors having a significant impact on trade performance such as investment, labor productivity, and labor participation.

Regarding the question as to how binding constraints faced by selected country groupings differ from the general results, the paper finds that:

- *For landlocked countries, results show that geographical constraints are not the only reason for their relatively low trade performance. Better domestic policies would make an important contribution to trade expansion.* Restrictive trade policies (measured by the customs tariff) have a larger impact on trade performance in landlocked countries than in other countries, although their impact remains small in comparison to other constraints. Policies fostering investment also have a sizable trade impact, although slightly smaller than in the unrestricted sample. Better macroeconomic policies also contribute to better economic performance. In this context, the priority seems to be more on exchange rate policy than on fiscal policy. In contrast to what was found for the unrestricted sample, access to credit and fiscal policy do not appear to explain the trade performance of landlocked countries. The impact of infrastructure is different than for the unrestricted sample. Electricity is again a major constraint to trade but the main constraint is its availability rather than its reliability. Domestic transportation infrastructure is not an important determinant of the trade performance of landlocked countries. In line with the literature, this result points to the importance of other factors such as the infrastructure of transit countries, transport costs associated with longer inland transportation than for coastal countries, time costs, and regulatory issues of the transport sector and when crossing borders.

- *For small and vulnerable economies (SVEs), trade is a necessity both to overcome the impact of restricted market size and to foster economic growth.* Small market size results among other things in a substantial concentration of exports in a few product groups. Estimation results show that infrastructure plays a key role in SVEs performance. Increasing road density and its quality has a large impact on trade and on economic growth. The impact of electricity infrastructure problems, although the main complaint of SVEs exporters, appears to be more limited and is due to reliability rather than availability. In contrast with findings for other groups, the telecommunication infrastructure also contributes to the trade performance and economic growth of SVEs. The impact on trade is smaller than for other types of infrastructure and may be related to the role telecommunications play in addressing the problem of remoteness from main markets that affect many SVEs. Turning to

domestic policies, estimations show that improving access to credit and, to a lesser extent, strengthening property rights would have the largest pay-off.

- *For commodity exporters, governance is a priority.* In addition to policies related to better governance (notably better fiscal spending, investment, and prevention of overvaluation of the real effective exchange rate), the tariff regime is a constraint to trade performance (imports and exports). This contrasts with estimations for other country groupings but is robust to alternative variables and specifications. Although the impact of import tariffs remains limited, it is much larger than in any other country groupings and highly statistically significant. Infrastructure problems appear to be less severe than in other country groupings and constrain only exports. The main constraint related to infrastructure is the availability of electricity. However, its impact, although large, is relatively less severe than for other country groupings. Investment promotes only imports, which may be due to the fact that most large extractive projects are financed externally.

Identification of bottlenecks and barriers is critical, and understanding of how they affect potential traders is an area where Aid for Trade can make a large contribution.

Anne O. Krueger (2011)

1.   Introduction[1]

Trade can be a powerful engine for economic growth, poverty reduction, and development. However, harnessing that power is often difficult for developing countries, particularly the least developed ones because of supply-side domestic constraints (lack of trade-related infrastructure and capacity). The Aid for Trade Initiative was launched to address these constraints.

The OECD report "Binding Constraints to Trade Expansion: Aid for Trade Objectives and Diagnostics Tools" [COM/DCD/TAD(2009)5/FINAL][2] shows that trade-related needs of developing countries are numerous, while political and financial resources are scarce and available only over time. Prioritization is therefore crucial to sequence the trade reforms[3] and to guide aid-for-trade interventions.

It is not easy to identify which needs should be tackled first because trade-related needs are not only numerous, but also multi-faceted and country-specific. This was an important conclusion of the Second Global Review of Aid for Trade held in 2009. In his closing remarks at this event, WTO Director General Lamy (2009) stressed: "We also learnt that Aid for Trade needs to factor in specificities; for example, those of middle-income countries and the types of financing available to them; or those of landlocked countries, small economies, remote islands or countries emerging out of conflict." Therefore, *Binding Constraints to Trade Expansion* recommends that the growth diagnostics procedure developed by Haussmann *et al.* (2005) be adapted to trade expansion. Figure 1 provides an illustrative decision tree of how such an adaptation may look, building on the many factors identified in the trade literature as potential constraints to trade expansion.

A second OECD report, "Increasing the Impact of Trade Expansion on Growth: Lessons from Trade Reforms for the Design of Aid for Trade" [COM/DCD/TAD(2010)4/FINAL] [4] argues that Aid for Trade should not only focus on helping developing countries to turn trade opportunities into trade, but also tackle the binding constraints that choke the impact of trade on economic growth. It also shows that although most trade reforms had a positive impact on economic growth, some proved to be unsustainable and others did not have any meaningful impact on growth. The report analyzes the various reasons for this and draws lessons for the design of aid-for-trade projects and programmes in order to increase their impact on trade performance and on growth. It argues that the scope of activity of Aid for Trade is broad enough to support both the compatible policies that will make a trade reform sustainable and many of the complementary policies that will increase the growth impact of trade expansion.

Figure 1. Growth Diagnostics Adjusted for Trade
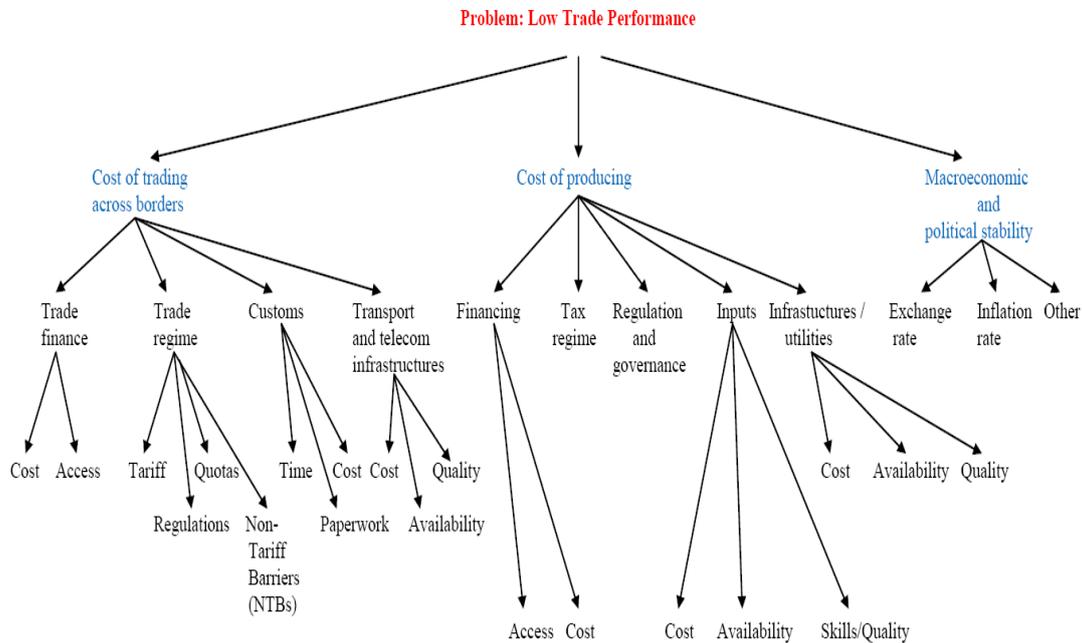
Source: Hallaert and Munro (2009).

The present report builds on the lessons of the two previous reports to identify the most binding constraints to trade expansion and estimate their severity for trade and economic growth. This process is crucial to prioritize reforms and to guide aid-for-trade resource allocations. To the best of the author's knowledge, this has never been done. One paper that may be viewed as attempting to do so is Agboghoroma *et al.* (2009). However, this work: (i) is limited in its scope as it focuses on the impact on GDP per capita growth of only a few variables: investment, openness, education, and the quantity of infrastructure. This is insufficient as these variables capture only a limited number of potential binding constraints (Figure 1) and ignores among other things complementary policies. Therefore it does not allow a ranking of the most binding constraints; (ii) does not take into account country specific needs; and (iii) does not investigate the specific constraints to exports and imports. These are crucial elements as is shown in this paper.

The core of the analysis of the present report is a cross-country econometric analysis.[5] The primary objective is to identify the most binding constraints to trade performance. This has two implications for the econometric work. First, we do not test a theoretical model. We instead rely on experimentation to provide the best approximation able to account for the majority of the data and to identify the most binding constraints for various country groupings. Thus the specifications differ from one country grouping to another. Second, more than the actual point estimates, it is the relative severity of the various constraints that is of interest.

In order to take into account an important factor highlighted during the Second Global Review on Aid for Trade, namely that binding constraints differ across countries, the analysis is also disaggregated for some smaller country groups. The reason is that for countries in similar circumstances (e.g. landlocked economies, small and vulnerable economies, or commodity exporters), similar constraints exist and these constraints are

likely to be different than those faced by other types of countries. Therefore, the specifications differ across country groupings. Due to external validity concerns, the insights of the econometric work are supplemented by two case studies: Uganda and Azerbaijan. The case studies aim at providing illustrations of the mechanisms highlighted by the econometric work and the importance of some variables that econometric work could not capture because of data limitations.

The remainder of the paper is organized as follows. Section 2 presents the empirical strategy and discusses the data issues. Section 3 analyzes the results for the unrestricted sample. This work will serve as a benchmark in the discussion for the results of the country groupings (Sections 4 to 8).

This paper is part of the "Aid for Trade" intermediate output (output area 3.1.1, activity 2.2) of the Programme of Work and Budget 2011-12 of the Trade Committee [TAD/TC(2010)1]. It is the third of a series of reports on binding constraints to trade expansion. The report benefited from funding by the European Union.

2. Estimating the impact of the various binding constraints: methodology and data

2.1 Econometric strategy

The econometric strategy is described in detail in Appendix 1. Consistent with the argument that Aid for Trade should target not only the binding constraints that prevent partner countries to turn trade opportunities into trade flows but also the binding constraints that choke the impact of trade flows on economic growth (Figure 2, Hallaert, 2009 and 2010), the econometric work proceeds in two steps. First, the impact of the various binding constraints is used to explain partner countries' trade. The predicted values of trade are then used to see the impact of these binding constraints on economic growth. The explanatory variables are in logarithms. As a result the estimated coefficients provide elasticities.

Three measures of trade are considered: imports as a share of GDP, exports as a share of GDP, and openness (exports plus imports as a share of GDP). Thus, the analysis is not limited to openness. The estimates for openness provide the *net* effect of binding constraints on trade expansion. This is crucial, but to draw meaningful policy implications, it is important to see the impact of the various constraints on both exports and imports. Indeed, the severity of a given binding constraints may be different on exports and imports. Moreover, both imports and exports are sources of economic growth, but as they affect growth through different channels identifying the impact of the various binding constraints on both exports and imports is crucial.

It is important to note that, consistent with the mandate of Aid for Trade, only supply-side constraints are considered in the present analysis. As a result, market access conditions are considered asymmetrically. They are considered on the import side (the import tariff variable) because they are under the control of the developing countries' government and constitute a potential supply-side constraint to trade, but they are not considered on the export-side because, although relevant for export performance, they do not constitute something governments of partner countries can affect.

Figure 2. Causality Chain in Aid for Trade and Binding Constraints
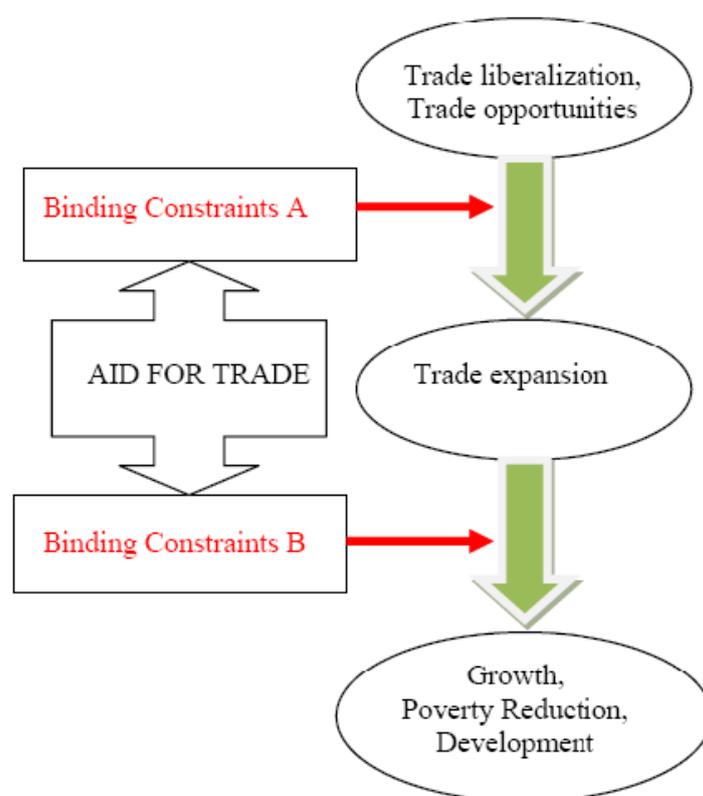
Source: Hallaert and Munro (2009).

For all the country groupings, many econometric specifications were tested to identify the most binding constraints. We do not try to test a theoretical model but rely on experimentation to identify the most severe constraints for each country grouping. As the size of the samples is small compared to the long list of potential constraints, it is impossible to simultaneously test all variables effectively. The methodology employed addressed the most common technical problems encountered in the literature, such as specification uncertainty and omitted variables, endogenous variables, parameter heterogeneity, and outliers in the data. Therefore, the results report only the most binding constraints and the specifications tend to be different across country groupings. The results for the unrestricted sample, in addition to providing a more complete specification than would be possible for a more limited subsample, provide a benchmark against which to analyze and compare the subsamples' specificities, i.e. to see how the binding constraints in a given subsample differ from "the average." Many econometric specifications that included alternative variables were also tested as robustness checks. Not all specifications for all the variables tested are presented in this paper but the more illustrative regression models are included in Appendices 4, 5, 6, and 7 for each country grouping.

The methodology used allows us to answer a few questions on the binding constraints that were highlighted in the first two papers (Hallaert and Munro, 2009; Hallaert, 2010), and which are important for the effectiveness of Aid for Trade.

How severe are the various impediments to trade expansion? The methodology used allows us to rank the relative severity of the various constraints to trade. It helps to

identify the most binding constraints and prioritize and sequence the reform and aid-for-trade programmes and projects. This is a prerequisite to improve the effectiveness of Aid for Trade. It is important to note that not all the possible constraints to trade illustrated in Figure 1 could be estimated so that the ranking is limited to the variables that could be quantified.

What is the impact of tackling the binding constraints on trade and on economic growth? The estimation method allows to estimate the total impact of the binding constraints on economic growth and break down this impact between the impact through trade (indirect impact) and the impact through other channels (direct impact). However, the direct impact should be seen as suggestive rather than as a precise estimate because we only include the variables to estimate the impact of the binding constraints on economic growth. This implies the theoretically-based mechanisms by which the binding constraints directly affect growth are not modeled, potentially causing us to ignore many key contributors to economic growth leading to the well-known problem of omitted variables. In addition, the growth equation uses the *predicted* values of trade rather than the *actual* values of trade. Thus, the predictive quality of the first step (the impact of the constraints on trade) determines the quality of the growth equation.

What are the specific constraints faced by countries having in common some key characteristics? An analysis on country groups sharing an important specificity shows that binding constraints differ across countries and do not have the same severity. Therefore, priorities and sequencing of reforms and of aid-for-trade interventions should differ across countries. The results for the various country groupings remain aggregated and point estimates are valid only for a representative country, and not for all single countries within the group. Caution is thus required when using the results for a country-level analysis and aid allocation. Nonetheless, the standard errors of the estimates allow inferences to be made within their range with a high level of confidence. Some country specificities not captured by the econometric work are detailed in the case studies for Azerbaijan and Uganda.

What is the impact on trade (openness) but also on imports and exports on growth? This report thus offers another opportunity to call the attention of the aid-for-trade community to the contribution imports can play to achieve the objectives of using trade as an engine for growth, poverty reduction, and development. In addition to the already mentioned methodological reasons for breaking down the *net* impact on trade of various constraints into effects on imports and exports, there are also additional economic and political-economic reasons.

A reason for breaking down the impact of binding constraints on openness into its impact on exports and imports is related to the political economy of trade reform and the political economy of the Aid for Trade Initiative. The Hong Kong declaration (WTO, 2005a) stated that the objective of the Aid for Trade Initiative is to "expand trade." However, the Task Force on Aid for Trade focused on increasing exports. "Aid for Trade is about assisting developing countries to increase exports of goods and services, to integrate into the multilateral trading system, and to benefit from liberalized trade and increased market access" (WTO, 2006). The political economy of trade reform and trade negotiations tends to overlook an avenue that the trade literature highlights as crucial in the trade and growth nexus: imports.

The role of exports is well recognized as a source of growth and sometimes reflects the persistence of mercantilist views of trade. Interestingly, although trade economists long ago moved away from this approach, initial cross-country regressions trying to

establish empirically the impact of trade on economic growth had export growth as a key explanatory variable.[6] The reason, as explained in Hallaert (2006), was that these studies were conducted in the context of analysis of outward-orientation strategies. The idea was that exports generated positive externalities on the rest of the economy and thus affected economic growth. However, the results of these analyses were plagued by econometric and conceptual problems. Export growth is an imperfect and noisy proxy for trade policy and is largely endogenous. This led to difficulties in identifying causation: cross-country studies tried to measure the impact of trade on growth but potentially overestimated it because they captured both the impact of trade on growth and the impact of growth on trade. Moreover, studies such as Levine and Renelt (1992) found that imports and total trade could equally explain growth, suggesting that total trade rather than just exports are the appropriate explanatory variable. Growth was the key explanatory variable in many early cross-country regressions on growth. Therefore, the literature has moved to new measures of trade and trade policies, such as trade shares, that are used in this report (Hallaert, 2006).

The crucial contribution of imports to economic growth is not well understood beyond the circle of trade economists. It is at best marginal in public debate, policy-making decisions, and in the design of aid projects and programmes, including those related to Aid for Trade. As Krugman (1993, p. 24) explains: "Even more fundamentally, we should be able to teach students that imports, not exports, are the purpose of trade. That is, what a country gains from trade is the ability to import things it wants. Exports are not an objective in and of themselves: the need to export is a burden that a country must bear because its import suppliers are crass enough to demand payment." This has important implications for Aid for Trade which appears to overlook the role of imports. Besides the change in focus from trade expansion at the Hong Kong Ministerial to the focus on increase in imports of the Task Force on Aid for trade, evaluations of aid-for-trade projects ignore the role of imports. In a meta-evaluation of aid-for-trade projects conducted for the OECD, Delpeuch *et al.* (2010, p. 5) conclude "First, evaluations of Aid for Trade operations do not say much about trade. The terms trade and exports are not among the most frequently mentioned, and the WTO or regional trade agreements are largely ignored by the evaluators. Even more importantly from an economic point of view, the word imports is even almost completely ignored."

One difficulty in explaining the role of imports in growth was that proving empirically the relevance of the various avenues through which imports foster growth was limited by data availability. Theory suggests that imports can foster growth through many channels including its pro-competitive impact, reallocation of resources towards more efficient uses, improvements in domestic manufacturing by lowering the cost of inputs and of capital goods, but also by allowing access to foreign technologies embedded in inputs. Most of these gains from trade are dynamic, i.e. imports increase productivity, which is a key determinant of economic growth and in per capita income.[7]

Until recently, the empirical literature relied on macroeconomic cross-country regressions.[8] However, these regressions faced econometric shortcomings and were unable to identify the channels through which trade impacts productivity and trade. The seminal paper from Coe *et al.* (1997) showed that openness to imports of capital goods (supposed to incorporate trading partners' stock of knowledge) enhances total factor productivity growth. Yanikkaya (2003) found support for the hypothesis - stemming from the new growth theory - that trade promotes growth through technology transfers: the more a country (especially for developing countries) trades with the United States (one of the most highly innovative countries), the more likely it is to grow faster.

Recently very detailed firm- and plant-level data have become available, and the empirical literature has moved to a microeconomic approach. This has several advantages. First the microeconomic approach can better control for country specificities than cross-country regressions at the macroeconomic level but also can focus on better defined policy changes. Second, it allows documenting how the impact of trade and trade reform differs across industries. Third, and probably more importantly, it can test and measure the various channels through which trade affects growth (something that cross-country regressions at the macroeconomic level could not do). Because of data constraints, this literature focuses mostly on OECD countries and large emerging countries, and leads to three interesting conclusions for this report.

First, imports have a positive impact on productivity because they increase competition and thus lead to an improved allocation of resources and better management practices.[9] Tybout and Westbrook (1995) in the case of Mexico, Aw and others (2000) in the case of Taiwan, Pavcnik (2002) in the case of Chile, Muendler (2004) in the case of Brazil, Amity and Konings (2007) in the case of Indonesia, and Topalova and Khandelwal (2010) in the case of India provide suggestive evidence backing the importance of this channel.

Second, the literature has provided more robust and clearer evidence that, because foreign technology is embedded in imported goods, imports are a major source of technology.[10] The literature looked at the impact on productivity from increased imports following trade liberalization distinguishing the impact on productivity of imported intermediate inputs and capital goods from the impact of imported final goods. For example, using plant-level data for Indonesia during 1991-2001, Amity and Konings (2007) not only found that cutting tariffs on final goods increases productivity by its competitive effect but that a reduction in tariffs on inputs has a larger impact on productivity via learning, variety, and quality effect. They found that a 10 percentage point cut in input tariffs leads to a productivity gain of 12% for firms that import their inputs. This is at least twice as high as productivity gains from reducing tariffs on final goods. For India during 1989-1996, Topalova and Khandelwal (2010) find an even larger impact. Based on firm-level data, they estimate that the competition effect of a 10 percentage fall in tariffs on final goods led to a 0.32% increase in productivity compared to a much larger increase of productivity of 4.8% for a similar cut in input tariffs due not only to cheaper access to inputs but also access to new inputs. Harrison *et al.* (2011) reach the same conclusion for a longer period 1985-2004: the reduction in tariffs on inputs is associated with an increase in aggregate productivity of 21.8% which is more than the impact of the cut in final good tariffs (3.2%) or Foreign Direct Investment (FDI) liberalization (2.2%). Indeed, Goldberg *et al.* (2008) show that trade liberalization and market reforms led to a surge in imported inputs, with more than two-thirds of the intermediate import growth occurring in new varieties: the 130% increase in imports between 1987 and 2000 was more driven by imports of intermediate inputs (227%) than by imports of final goods (90%). Moreover, showing that trade liberalization affects productivity not only from lower costs of inputs but also from access to new inputs: new intermediate inputs accounted for 66% of total intermediate import growth. They provide evidence that Indian firms increased access to new inputs can explain the explosion in new products manufactured by Indian firms: industries that experienced the largest declines in input tariffs contributed relatively more to the introduction of new products by domestic firms. The impact of imports on economic growth through productivity is large: it explains 7.8% of the 25% growth in manufacturing.[11]

Stone and Shepherd (2011) by undertaking a multi-country analysis at firm level show that these findings are not country-specific or dependent from a specific liberalization event but are of broad applicability. They also find intermediate inputs imports have a significant and positive impact on firm total factor productivity but also show that imports of capital goods have the same impact although more limited. "Assuming constant returns, a firm that imports 100% of its inputs is around 30% more productive than a firm that uses domestic inputs only; and a firm that uses imported capital goods is around 20% more productive than one that uses domestically sourced capital goods only." Importantly for Aid for Trade, they also find that the links between imported intermediates to productivity gains and innovation are stronger in non-OECD countries.[12]

Third, the impact of imports on economic growth through productivity and innovation is not limited to the technology embedded into imports but also from competition from cheaper imports. Using a firm and plant level panel data, Bloom *et al.* (2011) find that competition from Chinese imports explains 11.8% of total factor productivity growth, in twelve European countries over the period 2000-2007 and 15.2% over the period 2004-2007. About two-thirds of the impact is due to within firm productivity growth and one-third from reallocation from less productive firms to more productive firms (consistent with the model developed by Melitz in 2003). Moreover, the authors show that Chinese competition is associated with increases of various measures of innovation (patents, use of information technologies, and Research and development).

This literature also stresses that the impact of imports on growth is magnified by complementary policies. Topalova and Khandelwal (2010) observe complementarities between trade liberalization and additional market reforms (measured by delicensing and liberalization of FDI): the efficiency gains from trade reforms were largest in industries that also experienced the most deregulation and the biggest progress in FDI liberalization. Stone and Shepherd (2011) show that access to skilled labor and access to finance are particularly important to allow firms to *generate* productivity gains from intermediate goods imports while access to finance and macroeconomic stability are important for the impact of imported capital goods. Similarly, it will be important to include variables proxying the regulatory environment as Chang *et al.* (2009) found that the positive impact of trade on growth is larger if it is accompanied by increased education, infrastructure, and deeper financial market, but also institutional and regulatory reforms. Bolaky and Freund (2008) found that the impact of trade liberalization is magnified if it is accompanied by a regulatory reform. They showed that increase in trade does not positively affect growth in heavily-regulated economies, but once the effect of domestic regulation is controlled, the impact of trade on growth is larger than has been found in other studies. This clearly suggests that regulatory reform increases the impact of trade on growth. All these variables are potentially key binding constraints to trade expansion (Figure 1) and, as argued in Hallaert (2010), are for most of them part of the aid-for-trade agenda. It is therefore important to include them, as far as possible, in the econometric specifications tested in this report.

2.2 *Case studies: Supplementing econometric evidence*

Econometric work provides important insights allowing us to identify and rank the various binding constraints to trade expansion and to distinguishing their impact on both imports and exports. This is crucial in effectively sequencing both trade reforms and aid-for-trade support.

However, an econometric approach cannot test all potential binding constraints because of the limited size of some country groupings and because of inherent data problems. For example, the severity of some likely binding constraints such as time to trade, burden of customs procedures, and non-tariff barriers could not be quantified econometrically either because data are not available or only available for a limited time-span, or for a limited number of countries. Moreover, although country groupings are designed to capture a crucial specificity, countries within each group are often very different and these other specificities are ignored.

The insight of the econometric work is thus supplemented by two case studies that cover all the country groupings considered:

- Uganda: a landlocked country as well as a small and vulnerable economy.

- Azerbaijan: a landlocked country as well as a commodity exporter,

These two countries reflect different regions and different income groups. Uganda is a low-income economy, while Azerbaijan is an upper-middle-income economy. The strength of the case study approach lies not so much in its ability to draw generalize findings (this is the strength of the econometric work) as in its ability to gain deeper insight into the binding constraints faced by a country than can be done through cross-country econometric work.

In addition, given that results show that electricity is a major constraint to trade performance, the avenues through which electricity problems affect trade performance are illustrated with the case of Djibouti.

2.3 Data: Description and limitations

In order to test the impact of as many constraints as possible, a database for the 153 countries and territories that are recipients of Official Development Assistance (ODA) has been compiled.[13] This database includes 426 variables relevant to the analysis and covers the period 1981-2009. However, not all observations for all variables are available for all countries and for the complete period.[14]

The list of relevant variables was established taking into consideration the lessons from the two preceding papers on binding constraints, namely: (i) the list of potential binding constraints highlighted by the empirical literature as described in Hallaert and Munro (2009) and summarized in Figure 1 and (ii) the compatible and complementary policies needed to make the trade reforms sustainable and increase their impact on economic growth described in Hallaert (2010).

Despite considerable effort to develop the database, data availability remained a constraint which often proved significant for the econometric work, notably for the subsamples. Some variables were only available for a small number of countries. For example, while efforts were made to gather data for the 153 partner countries and territories, observations for the explained variables (imports, exports, and GDP)[15] were only available for 102 partner countries. To address this problem some alternative proxies were used and the econometric specification was modified. For example, while it would have been relevant to use applied customs tariffs in the estimation, data availability leads to a dramatic drop in the country coverage and number of observations. As a result, the most favored nation (MFN) tariffs were used instead. Nonetheless, applied tariffs were used to test for robustness of the results. Moreover, some variables such as the key

variables on time to imports and exports, customs procedures, cost of shipping listed in the World Bank's *Doing Business* could not be used despite their wide country coverage because they are limited to a short period of time.[16]

In addition, the annual frequency of some variables can be misleading as they are measured less frequently and interpolated to transform them into annual observations, thus presenting limited time variation. When examining the data collected it was not apparent which variables had been interpolated. This highlights the inherent statistical measurement error associated with the annual frequency of the variables. Each variable collected has its own data generating process and some reflection should be devoted in understanding what type of information and structure is being conveyed by the resulting observations. One observation per year per country may be considered a summary of events related to the variable of interest, but it does so by assuming away within country heterogeneity related to the salience of different sectors in the economy and limited variability across time of slow changing factors. However, there is no better alternative with respect to obtaining more and higher quality data which would conform to the objective of this project and applies to the whole set and type of countries analyzed in this paper.

In total, 65 countries for the period 1981-2009 could be analyzed in this report. These countries are listed in Appendix 3 and account for 57% of the Aid for Trade disbursed since the inception of the Aid for Trade Initiative (i.e. 2005-2008) and 55% of 2008 aid-for-trade commitments.[17]

3.   Results for the unrestricted sample

Core results for the unrestricted sample are presented in Table 1. They will be used as a benchmark against which the results for the sub-sample will be assessed. For this reason, as many binding constraints as possible are included. This means data requirements are large and could only be met by 36 countries. It is important to control for GDP in both the trade and the economic growth equations (Appendix 1). In the trade equation, the impact of the size of the economy on openness needs to be controlled for in order to properly identify the impact of domestic policies. As expected, the lagged GDP variable is negative and significant reflecting the well-known fact that larger countries tend to trade *relatively* less. In the economic growth equation, initial GDP is needed to capture the catch up effect (called convergence) highlighted by the macroeconomic literature on growth. Convergence implies that the relationship between any past size and the economic growth rate is negative. Although not shown, lagged GDP is indeed negative and statistically highly significant for the growth equation.

First, the results provide support to the claim that needs are country specific and thus confirm the approach taken to analyze the binding constraints for countries that share some key characteristics. Results (2) in Table 1 include binary dummies ("dummies") capturing various country groupings. Results suggest that landlocked countries differ the most from the average partner country. Being landlocked is a significant geographical barrier to openness to trade. The openness ratio of landlocked countries is 6 percentage points lower than for other partner countries. The gap is larger for exports (8 percentage points) than for imports (5 percentage points). This is consistent with findings of other studies. For example Grigoriou (2007), on the basis of a gravity model, found that ceteris paribus a landlocked country imports 22% less and exports 34% less than a coastal economy. In contrast, results show that being an island is not a significant disadvantage.

As a result, this country grouping will not be analyzed in this report.[18] Being a small and vulnerable economy (SVE) or a commodity exporter tends to have a limited impact which is not significant except for commodity exporters' imports.[19] As a country can belong to several groupings (for example, Uganda is both a landlocked and a SVE, Paraguay is a landlocked country, a SVE, and a commodity exporter), only two country groupings for which there is no overlap are included under heading (1). This specification confirms the results that a landlocked country faces significant and large impediments to trade integration and that this geographical situation affects both imports and exports, while being an island is not a significant advantage or disadvantage.

Second, as expected, both imports and exports appear to be a source of growth. Although these results should be seen with caution for the reasons explained in the previous section, they provide useful insight. The impact of trade on growth is larger for imports than for exports. This may be due to the large impact of imports on productivity and thus on growth or because the fit of the import regression is better than the one on exports because imports depend mostly on supply-side constraints while exports depend on supply-side constraints as well as market access (and market access is not captured in the regressions).

Third, binding constraints to trade appear to be different for exports and for imports. Air transport, labor force, labor productivity and the rule of law appear as significant factors that affect exports but not imports while lagged investment, access to domestic credit (or the depth of the financial sector), and mismanagement of the real effective exchange rate appear to significantly affect imports but not exports. Other constraints affect both imports and exports: availability of roads, reliability of electricity, fiscal policy, and import tariffs. As a result, the ranking of the binding constraints differs if we look at openness, exports or imports.

3.1 The most binding constraints to trade

Trade policy measured by import tariffs has a statistically significant impact but its magnitude is small. Results provide additional empirical support to the Lerner symmetry theorem (Lerner, 1936) which states that an import tariff acts as a tax on a country's export sector.[20] According to the econometric work a 10% cut in MFN import tariffs has the same, positive, significant and modest, impact on both imports and exports: over 0.1 percentage point. The impact of a tariff cut on trade flows pales in comparison to the impact of tackling other supply-side constraints. This result is consistent with the large body of research that concludes that the impact of trade facilitation and other measures to reduce supply-side constraints as listed in Figure 1 is much larger than removing trade policy restrictions.

Tariffs are, however, only one of the many restrictive trade policy measures. It would be ideal to supplement the tariff variable with others that capture the impact of non-tariff barriers (NTBs). Unfortunately there are no consistent data for NTBs across countries and for the period under study. As indicated above, the MFN tariff is used because the presumably more accurate applied tariff was available only for a limited period and for a smaller number of countries. This would lead to a drop in observation from 176 to 87 covering only 30 countries. The results are thus more fragile and are presented in Appendix 4 (Table A4.1). The impact of import tariffs remains significant on both imports and exports and is slightly larger at about 0.15. Moreover, using the applied tariff

result in a better fit and the impact of trade on growth appears to be twice as large as in the core results (and even three times larger for imports).

Infrastructure problems are a significant constraint to trade. In a report on Aid for Trade, Agboghoroma *et al.* (2009) could not establish econometrically an impact of four infrastructure variables (telecommunications, roads, railways, and power generating capacity) on economic growth through trade, but caution is needed because they only measured the quantity of infrastructure and not its quality or usage. In this paper, we go into greater depth. First, we analyze both quantity and quality of road and electricity infrastructure and find that the quantity of transport infrastructure (rail and road) has a significant impact as does the quality of electricity supply. However, we reach the same conclusion for telecommunications. We could not find a trade impact of the various variables that capture quantity of the telecommunications infrastructure (fixed, mobile, and internet connection). Second, as the impact of trade on growth is positive, these types of infrastructure have an impact on growth through trade.

Electricity reliability appears to be a more significant binding constraint than road or air infrastructure. The impact of electricity is large and statistically significant at the 99% confidence level: improving the reliability of electricity by 10% increases openness by almost 2 percentage points. The impact is larger on exports (2.4 percentage points) than on imports (1.7 percentage point). This large effect supports the claim of firms in developing countries that electricity is the main problem not only for business in general but also exports. According to the *Enterprise Surveys* (World Bank, 2010),[21] firms in 29% of partner countries rank electricity problems as their main business problem and in 68% of the partner countries, electricity is listed in the top three constraints. As illustrated in Figure 3, this problem is the main business constraint for both exporters and importers, and that it is slightly larger for exporters than non-exporters. Reliability is more of an issue than availability.

Table A4.2 suggests that the availability of electricity, proxied by consumption per capita of electricity, is less a constraint to trade than its reliability (which is statistically insignificant). Indeed, producers can address the lack of electricity by using generators. Generators are required for exporters in many countries, e.g. for textile exporters in the Special Economic Zones of Madagascar. Hoekman (2010) reports that, in Nigeria, over 90% of firms with more than 20 employees have generators. The use of generators has a cost: the marginal cost of electricity produced by generators is about two and half times higher than electricity from the grid, and the capital cost of a generator is about 20% of the total cost of machinery and equipment. This shows that lack of electricity can dramatically affect production costs and thus reduce exports competitiveness and, thus, trade performance. But the cost of unreliable electricity can be even greater. Unreliable electricity not only requires the purchase of generators but can damage machineries and equipment used in production due to fluctuation in power intensities. Box 1 provides additional evidence.

Figure 3. Surveys of business constraints in developing countries
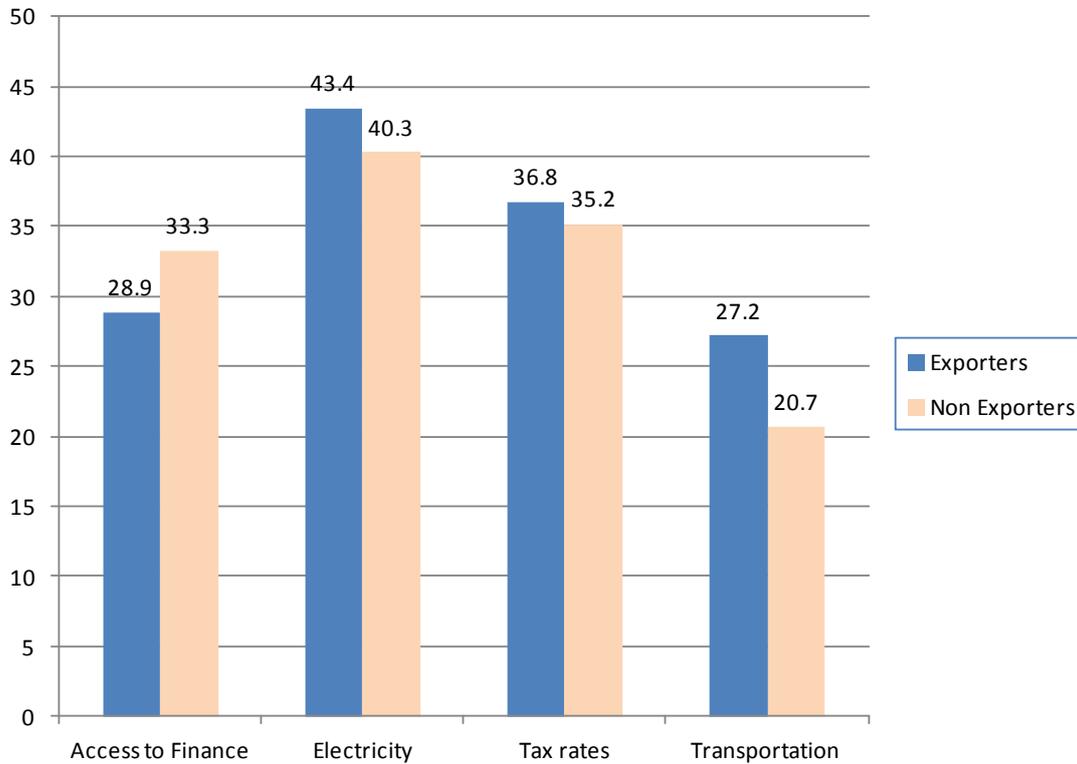
Source: Author's calculations based on World Bank (2010).

Transportation problems also constitute a significant constraint. However, according to the *Enterprise Surveys*, transportation is a much less significant business problem than electricity. Table 1 shows that both air transport and road transport infrastructure affect the trade of partner countries. Increasing the quantity of each mode of transportation by 10% increases openness by roughly 1 percentage point. However, while the impact of air infrastructure appears limited to exports, road infrastructure affects both exports and imports. The quantity of road infrastructure has a more significant impact on trade than does the quality of infrastructure proxied by the share of paved roads (Table A4.3).

In addition to its impact on economic growth through trade, transport infrastructure has also an impact through the non-tradable sector. A 10% increase in air (or in road transport) infrastructure increases the economic growth rate by 0.2% of which about half is due to the impact through trade (0.08%). The impact of a 10% improvement in transport infrastructure on economic growth through trade is eight times larger than is the impact of a 10% cut in import tariffs, but about half the impact of a 10% improvement in electricity reliability.

Table 1. Results for the Unrestricted Sample

	(1)			(2)		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.287***	-0.413***	-0.192**	-0.277***	-0.401***	-0.183**
	(0.0906)	(0.106)	(0.0814)	(0.0852)	(0.0997)	(0.0766)
l_air_trans_carr_dep	0.101***	0.195***	0.039	0.119***	0.203***	0.067*
	(0.0388)	(0.0574)	(0.0343)	(0.0425)	(0.0598)	(0.0367)
l_roadkm2	0.097***	0.082**	0.111***	0.074**	0.064	0.083***
	(0.0280)	(0.0405)	(0.0238)	(0.0295)	(0.0392)	(0.0266)
l_electric_power_losses_p_out	-0.185***	-0.240**	-0.170***	-0.214***	-0.288***	-0.174***
	(0.0666)	(0.0984)	(0.0546)	(0.0644)	(0.0945)	(0.0546)
l_dom_credit	0.176**	0.004	0.290***	0.171*	0.011	0.271***
	(0.0866)	(0.117)	(0.0733)	(0.0907)	(0.121)	(0.0758)
Simple_average3_mfn	-0.013**	-0.014**	-0.011**	-0.012*	-0.013*	-0.010*
	(0.00561)	(0.00670)	(0.00506)	(0.00602)	(0.00703)	(0.00549)
l_gfcf1	0.423*	0.218	0.507**	0.480*	0.257	0.582**
	(0.254)	(0.294)	(0.228)	(0.273)	(0.313)	(0.242)
l_property_rights	0.229	0.496**	0.159	0.127	0.458**	-0.015
	(0.167)	(0.219)	(0.149)	(0.156)	(0.202)	(0.139)
l_l_force	0.138**	0.263***	0.055	0.154**	0.290***	0.057
	(0.0674)	(0.0857)	(0.0594)	(0.0770)	(0.0916)	(0.0700)
l_productivitity_per_worker	0.122*	0.309***	-0.027	0.110	0.287***	-0.026
	(0.0736)	(0.0942)	(0.0664)	(0.0681)	(0.0869)	(0.0625)
l_reer	-0.678*	-0.696	-0.572*	-0.557*	-0.580	-0.450
	(0.367)	(0.440)	(0.332)	(0.319)	(0.395)	(0.284)
l_government_spending	-1.570***	-1.840***	-1.404***	-1.737***	-2.016***	-1.553***
	(0.510)	(0.571)	(0.479)	(0.608)	(0.682)	(0.562)
Landlocked	-0.501***	-0.709***	-0.359***	-0.633***	-0.852***	-0.470**
	(0.126)	(0.179)	(0.113)	(0.196)	(0.247)	(0.183)
Island	0.005	0.019	-0.033	-0.004	0.033	-0.053
	(0.137)	(0.163)	(0.129)	(0.137)	(0.161)	(0.132)
SVE				0.264	0.246	0.274
				(0.185)	(0.218)	(0.166)
Commodity exporters				-0.069	0.040	-0.193***
				(0.0889)	(0.130)	(0.0730)
Constant	-2.972	-3.994	-4.095	-3.438	-4.582	-4.393
	(3.778)	(4.230)	(3.493)	(3.427)	(3.861)	(3.157)
Observations	175	176	176	175	176	176
R-squared	0.454	0.411	0.503	0.462	0.416	0.520
Trade variable in growth estimate	0.081	0.054	0.102	0.111	0.074	0.107
	(0.0885)	(0.0607)	(0.127)	(0.0801)	(0.0580)	(0.077)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Box 1. Electricity: A constraint to Djibouti's trade and development

The case of Djibouti shows how the availability, the reliability, and the cost of electricity affect private sector development and trade performance (notably through competitiveness and diversification of exports).

Availability: Djibouti faces a structural problem of electricity supply since 1990. Electricity is not provided in sufficient quantities to satisfy the needs of companies and individuals. Electricity shortages slow down the development of economic activities, the growth of the private sector, and international trade by removing the incentives for creation of new firms, the development of new exportable goods and services, and the arrival of foreign companies. In addition, limits to electricity availability hamper poverty reduction through a broader access to electricity. In 2009, 55% of the population had access to electricity and its bill could represent up to 25% of a household's average income.

Reliability: In addition to availability, electricity supply is unreliable notably during the dry season. For example, during the summer of 2009, capacity limits resulted in more than ten power outages per day in several districts of the capital, where 2/3 of the national population is concentrated. Frequent outages means that private firms need to use generators. Besides outages, electricity supply is unreliable because of fluctuations of power intensity which can damage the equipment and production (the cold chain interruption, in particular, slows down the development of the fishing sector). This translates into important revenue losses and high costs of equipment rehabilitation or repurchase.

Cost: Electricity is so expensive in Djibouti that it is considered one of the explanatory factors of the small size of the private sector, which contributes only to 22% of the GDP (AfDB, 2007). Djibouti's domestic electricity prices (30cUSD/kWh) were, after those of Chad (38cUSD/kWh), the highest in Africa (IMF, 2007). This costliness does not create the conditions for private financial profitability and limits the development of the productive sector. As an example, in the hotel business, the electricity cost alone accounts for 25% of the price of a night. This limits the development of tourism despite the country's potential and its need for such labor-intensive export. Indeed the unemployment rate is extremely high and estimated at 60% (UNDP, 2007).

In sum, the unreliable supply of electricity affects trade performance because it increases production costs, weakens competitiveness, prevents the development of some sectors, and contributes to export concentration.

Looking forward, the electricity problem is likely to become even more severe as, Electricité de Djibouti (EDD), a government-owned company, is unable to finance the investment needed to meet demand that is expected to grow at 5.2% per annum until 2020. EDD has been mostly unprofitable since 1990, because of the high production inputs costs (oil and labor especially) and management problems (technical losses and large arrears). Although very high, EDD's prices are not sufficient to cover the exploitation and amortization costs, and to allow new investments. In order to invest in infrastructure, EDD's only choice is to rely on donors and on public grants. However, as private participation in EDD has been a condition to donors' financial support since 1996, and because no progress has been made in this regard, the public company no longer benefits from aid flows.

Source: Foch (2011).

Access to credit is also a significant barrier to trade. Econometric results show that access to credit follows closely electricity reliability as the main binding constraint to trade expansion in developing countries. A 10% increase in electricity reliability increases economic growth by 1.9% while a 10% increase in credit-to-GDP ratio boosts economic growth through its trade impact by 1.8%.[22] This is due to the large and significant (at the 99% confidence level) impact of access to credit on imports. In sharp contrast, the impact on exports is close to zero and statistically insignificant. This result is consistent with the finding of many surveys in developing countries. For example, in the World Bank's *Enterprise Surveys,* it is reported as a major constraint to business, which affects more non-exporters than exporters (Figure 3). It is also consistent with the experience of trade finance providers such as the EBRD in emerging Europe and Central Asia. In 2009, the EBRD conducted a comprehensive survey of its partner bank in his ten-year old Trade Finance Programme. These partner banks acknowledged a significantly stronger impact of the Trade Finance Programme on import business

compared with the export business (EBRD, 2010). This result is noteworthy because most of the empirical literature focuses on the impact of financial conditions on exports rather on imports.[23] Our results appear consistent with other econometric work such as by Stiebale (2011) who, using French firm level data, could not find econometric evidence that financial constraint matters for export decision. [24] However, results of the literature are mixed and other studies, such as Minetti and Zhu (2011) in the case of Italy, find that credit rationing significantly affects exports.

What are the avenues by which access to credit (or the depth of the financial sector) affects trade performance? First, such access is an important determinant of investment and is thus needed to seize the opportunities obtained from trade and trade reforms (Hallaert, 2010).

Second, access to credit may be needed to help poor households move out of subsistence production: this shift requires both infrastructure and access to credit that allow poor rural farmers to reach the market (Hoekman, 2010).[25] A limited access to credit can affect growth directly, but also through trade if a credit constraint prevents the investment needed to take advantage of trade opportunities.

Third, access to credit is paramount to enable countries to realize the gains from trade and increase the impact of trade on economic growth (Hallaert, 2006). In particular it is important to allow countries to realize the productivity gains from imports of intermediate inputs and capital goods (Stone and Shepherd, 2011). This may explain why the results point to a very large impact of access to credit on openness that is fully explained by its impact on imports. A 10% increase in local credit in a partner country *increases* the openness ratio by 1.8 percentage point because of its impact on the ratio imports-to-GDP of 2.8 percentage points. The impact on exports is virtually null and not significant.

Finally, in developing countries, access to credit is often rationed due to legal and regulatory problems: in many countries, contracts are only weakly enforceable leading to requests of very large collaterals. For example, in the first half of the early 2000s, the weakness of Nepal's judicial system resulted in the weak enforcement of contracts and widespread willful defaults. This, combined with politically-motivated lending by the two state-owned or controlled banks, triggered a large build up of non-performing loans that brought the banking system close to insolvency (IMF, 2006 and 2010).

3.2   The importance of complementary and compatible policies

Econometric results support the view that governance is an important determinant of trade performance. The legal and regulatory environment and the enforcement of laws are proxied by the variable "property rights" (definition in Appendix 2). Results show that this "complementary policy" is particularly important and significant for exports. The result for imports is more limited, although in some specifications (see Table A4.3) its impact is statistically significant and large.

Complementary policies are not limited to governance issues. For example, results show that policies that increase labor productivity will contribute dramatically to trade expansion. Productivity has been chosen as an explanatory variable because, as discussed above, the literature emphasizes its role in trade performance but also because it is an important avenue through which trade boosts economic growth. A 10% increase in labor productivity increases the ratio exports-to-GDP by 3 percentage points. The impact on imports is close to zero (and is not statistically significant). This result is generally robust

to the alternative specifications presented in Appendix 4.[26] The impact of labor productivity on economic growth is large: a 10% increase in labor productivity is estimated to result in a higher economic growth rate of over 0.65%. Trade contributes to 0.10% while the non trade impact is estimated at 0.55%.

Education and training are important policies that can affect labor productivity. As Aid for Trade has a role to play in this area (Hallaert, 2010), we tested the impact of education proxied by secondary school enrolment. Using this variable, the number of countries increases from 36 to 47. Results report an impact that is about half the size of the labor productivity variable for all trade variables considered but is not statistically significant. This provides support for the assumption that education is an important source of labor productivity though, as expected, not the only one. The education variable has also been added to the core results of the subsample, but as is never significant it is not discussed further.

These findings support the importance of complementary policies to increase the impact of trade on economic growth (Nordås *et al.*, 2006, Hallaert, 2010, and Stone and Shepherd, 2011). They also highlight the importance of compatible policies. Compatible policies are mostly related to a macroeconomic environment conducive to sustainable trade reforms and trade expansion, and to the realization of dynamic gains stemming from the import of capital goods. These macroeconomic policies are captured by the real effective exchange rate, whose role in the success of trade reform is known to be extremely important and by government spending as fiscal problems are often sources of policy reversal (Hallaert, 2010).

Consistent with the empirical evidence summarized in Hallaert (2010), results suggest that an overvaluation of the real effective exchange rate is detrimental to trade expansion. The magnitude is very large: a 10% appreciation of the real effective exchange rate is associated with a reduction of the openness ratio by almost 7% of GDP. The impact of government spending is even larger, as an increase in spending is associated with an extremely large negative impact on trade. This result is consistent with a common finding in the growth literature: government spending has a negative impact on growth.

Our results suggest that the negative impact of government spending on economic growth may be explained in large part by the impact of government spending on growth through trade. This may be surprising given prior findings that more open countries tend to have bigger governments (see for example Rodrik, 1998)), and although it is beyond the scope of this paper to discuss the complex relationship between trade and government size, a few points are worth being clarified. While Rodrik uses only government consumption, we use total spending.[27] Moreover, Rodrik's finding comes from the fact that he links government size to the *previous* decade openness while we look at the contemporary link between government size and openness. This is a crucial difference and indeed when Rodrik tries to explain openness with the size of government, like us, he finds a negative relationship (in the case of Rodrik, the coefficient is not significant). Besides technical differences, interpretation can be different. Rodrik explains his finding by the fact that government tries to mitigate the negative consequences of increased volatility associated with openness.[28] However, this government function is often very limited in the countries we focus on and, in any case, certainly more limited than in OECD countries. This appears to be an important factor because when Rodrik split his sample in two income groups, the fit for the poorest countries drops dramatically. It is also plausible than in the sample of countries we focus on, large government spending

reflects fiscal unbalances (if the spending is not matched by revenues) or reflects more interventionist policies, including in trade matters, and more regulations.

The *Enterprise Surveys* suggest that firms perceive taxation rate as a major business constraint (Figure 3). We used government tax revenue as a share of GDP as an alternative fiscal variable because no synthetic indicator consistent across countries for a relatively long time period is available and because we are mainly interested in capturing the macroeconomic environment. Results, presented in Appendix 4 (Table A4.4), are fragile as due to data limitations, the number of observations collapses by about 57%.[29] Keeping in mind the fragility of the results, government tax revenue becomes positive and highly significant for all three explained trade variables (openness, imports, and exports) although its impact is much smaller than for spending. This suggests that a government capacity to face the volatility implied by openness to international trade and to secure the financing of its development needs is largely determined by the amount of non-aid revenue it is able to secure. Moreover, as emphasized in Hallaert (2010), revenue from domestic taxes has the advantage is less volatile than trade taxes or other flows such as aid or, as evidenced in the current crises, remittances and FDI (Bulír and Hamann, 2007). Thus, domestic taxes are more predictable and necessary to pay for the maintenance cost of projects financed by aid, including infrastructure projects financed by Aid for Trade (Gupta and Tareq, 2008).

Investment is particularly sensitive to compatible and complementary policies. Among other things, investment depends on factors such as the legal and regulatory environment and the access to credit. As it is a long term decision, it also depends on the macroeconomic environment and the protection of property rights. Moreover, investment is an important avenue through which trade affects economic growth but also an important area where Aid for Trade can have an impact (Hallaert, 2006 and 2010). Results show that the impact of investment is very large (a 10% increase in investment is associated by an increase in the openness ration of more than 4% of GDP), but significant only for imports (and openness). The impact on imports may be due to the fact that investment requires imported inputs in the following years. These results support the argument that imports of capital goods boost economic growth through their impact on total factor productivity and this impact is larger when the macroeconomic environment is favorable and access to credit is relatively easier (Stone and Shepherd, 2011).

Interestingly, if the quantity of capital (investment) seems to affect imports, the quantity and quality of labor (proxied by the size of the labor force and labor productivity) are statistically highly significant for exports (and openness). For example, a 10% increase of labor productivity increases exports as a share of GDP by more than three points. As for investment, complementary policies appear crucial. Policies affecting the labor market and education policies have a very large impact on export performance and trade expansion. This is consistent with other cross-country work such as Chang *et al.* (2009) or Bolaky and Freund (2008). Chang *et al.* (2009) found that the positive impact of trade on growth is larger if it is accompanied by increased education, infrastructure, and deeper financial market, but also institutional and regulatory reforms. Bolaky and Freund (2008) found that the impact of trade liberalization is increased if it is accompanied by a regulatory reform. They showed that the increase in trade does not affect growth positively in heavily-regulated economies, but once the effect of domestic regulation is controlled, the impact of trade on growth is stronger than what has been found in other studies (Hallaert, 2006).

In sum, results for the unrestricted sample show the complexity and interaction of the binding constraints' impact on trade. The most binding constraints to exports differ from the most binding constraints to imports. Nonetheless, experimentation shows that despite recent trade liberalization, a cut in tariffs can still boost export and import performance. The negative impact of customs tariff on trade expansion appears limited compared to the impact of electricity issues (reliability more than availability), but also transportation constraints (in this case it seems that availability is more a problem than quality) and access to credit. Moreover, the results confirm the importance of complementary and compatible policies (such as education, governance, the business environment, and macroeconomic stability are very important) for trade expansion and economic growth as they affect factors that have a large trade effect on trade performance such as investment, labor productivity, and labor participation.

4. Results for landlocked countries

Table 1 showed that landlocked countries face special constraints that reduce their trade integration significantly. According to these results being landlocked reduces a typical country's openness ratio by 5 percentage points. The impact is particularly important on exports, which are lower by 7 percentage points compared to average ODA eligible countries. This section will try to identify how the binding constraints faced by landlocked countries are specific. Another reason for analyzing this country grouping is that the international community pays specific attention to landlocked countries. The United Nations Millennium Declaration (United Nations, 2000) indicated that: "We recognize the special needs and problems of the landlocked developing countries, and urge both bilateral and multilateral donors to increase financial and technical assistance to this group of countries to meet their special development needs and to help them overcome the impediments of geography by improving their transit transport systems." As Target 8C of the Millennium Development Goals, the international community seeks to "address the special needs of landlocked developing countries and Small Island developing States through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly."

Landlocked countries are a very limited sample. There are 44 landlocked countries in the world, of which only 33 are ODA eligible. This poses a serious constraint for the econometric work as it limits the number of observations. This problem is compounded by the fact that data availability is a serious problem for many landlocked countries (notably African landlocked countries) and that data for many landlocked countries are only available since the early 1990s as the countries became independent only recently (e.g. the central Asian countries) or became landlocked after the partition of their countries (e.g. Ethiopia).[30] The immediate implication is that the regression model for landlocked countries is much more streamlined than for the unrestricted sample. Despite the simplified specification of the model tested, data availability limits the sample to 11 countries (Appendix 3). Therefore, the case studies focus on two different landlocked countries: Uganda and Azerbaijan.

According to the *Enterprise Surveys*, the ranking of the main binding constraints to exporters in the landlocked countries is similar to those of the unrestricted sample. Electricity is the main problem followed by tax rates, access to finance, then transportation (Figures 3 and 4). However, with the exception of electricity, these problems appear more severe as more firms complain about them. Another difference is

transportation: while both exporters and non-exporters complain more about transportation constraints than in the unrestricted sample, this affects much more exporters. This suggests that the transportation issue (in terms of cost and time) is more severe in landlocked countries because of domestic infrastructure and because of the infrastructure in the transit country. Except for tax rates (due to data availability), the econometric work will focus on checking if indeed because of the fact that these constraints are more severe explains the lower degree of openness of landlocked countries.

For landlocked countries, as for other developing countries, both imports and exports contribute to economic growth (Table 2). Keeping in mind the required caution in interpreting the impact of trade variables on economic growth, it appears that the growth effect of trade is slightly larger in landlocked countries. An increase by 10 percentage points in the openness ratio results in an increase of the growth rate of 1.6% compared to 0.8%-1.1% for the unrestricted sample. This result holds for both exports (1.7% compared to 0.5%-0.7%) and imports (1.8% compared to 1.1%).

As trade is relatively less important in landlocked countries than in other developing countries, avenues to increase trade in order to better use trade as an engine for economic growth must be identified.

Figure 4. Surveys of business constraints in landlocked countries

Per cent of firms mentioning the topic as a constraint
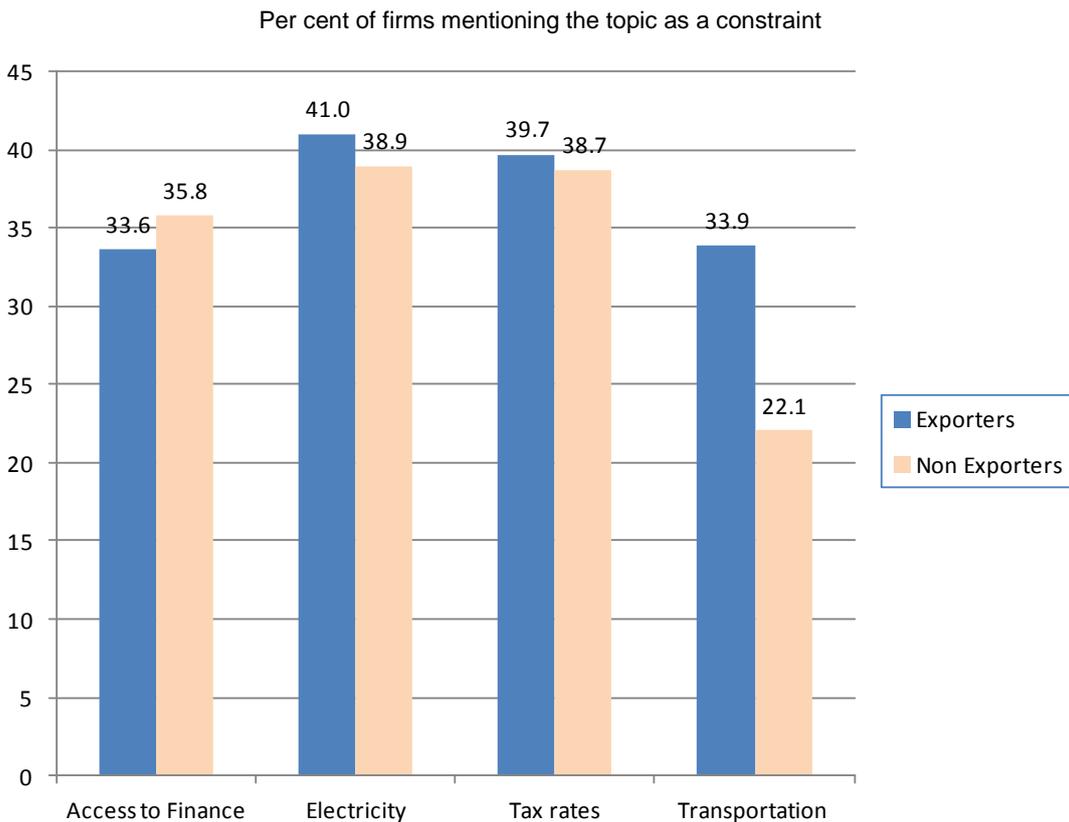
Source: Author's calculations based on World Bank (2010).

4.1 Poor policies are partly responsible for the low trade performance of landlocked countries

The low trade performance of landlocked countries is due in part to poor domestic policies. Restrictive trade policy (measured by import tariffs) seems to have a larger impact on landlocked countries than on average.[31] The impact is larger than for the unrestricted sample for openness and imports, and the estimated coefficient is statistically significant. Reducing import tariffs by 10% would increase the openness ratio and the import ratio by almost 0.2 percentage point. Consistent with the fact that import tariffs act as a tax on exports, a reduction of 10% of the customs tariff would increase the export ratio by 0.1%, slightly less than for the unrestricted sample. However, this result is not statistically significant. The trade impact of tariffs remains low and, as illustrated in the case of Uganda (Section 6), tariff reform is not the most binding constraint to trade expansion and will have a limited impact if it is undertaken in isolation, i.e. without being supported by or supporting other reforms.

Another symptom of the impact of poor policies on trade performance pertains to an inadequate macroeconomic environment. Results show a dramatic impact where there is mismanagement of the exchange rate. The impact of the real effective exchange rate level on trade performance is statistically significant at the 99% confidence level for all the three trade ratios considered (rather than at the 90% confidence level for only openness and imports in the estimates for the unrestricted sample) and the magnitude of the estimated coefficient is much larger than for the unrestricted sample. A 10% appreciation of the real effective exchange rate leads to a drop of almost 1percentage point of all three ratios. This result is robust to changes in the specifications (Appendix 5).

What about the impact of fiscal policies? Data problems and the limited size of the sample prevented us to run meaningful regressions using the government spending data used in the unrestricted sample. Although estimations are fragile due to the low number of observations, the first column in Table A5.1 presents this variable in a different specification. The impact of the real effective exchange rate is broadly unchanged, while government spending has a negative impact on trade performance (statistically significant). In contrast to the estimations for the unrestricted sample, government spending has a much smaller impact on trade performance than exchange rate policies. Moreover, the impact of government spending is about eight times smaller than for the unrestricted sample for openness and exports, and five and a half times smaller for imports.

Alternative fiscal variables, namely gov_spending_imf and gov_revenue_imf (defined in Appendix 3) have been tested to limit the loss of observations for more robust estimations. Results presented in Appendix 5 (Table A5.2) confirm that the negative impact of government spending on trade is more limited than the impact of the real effective exchange rate's level (the estimated coefficient of real effective exchange rate are robust to the change in specifications). Moreover, the two fiscal variables have a small and statistically insignificant impact.

Data limitations prevented us from having a close look at all complementary policies. It was impossible to run regressions using the productivity and size of the labor force. Property rights appear to have a small and positive impact (but not statistically significant). However, these findings (not shown) are fragile due to the low number of observations.

It was possible to look at the impact of access to credit. Results, presented in Table 2 and Table A5.2 suggest that access to credit is not a significant constraint to trade expansion in landlocked countries. As inland transportation problems and costs are often perceived as a major constraint to trade in landlocked country, it is interesting to note that Raballand and Macchi (2008) find evidence that access to credit does not seem to prevent the adequate supply of trucks in African landlocked countries (there is actually an oversupply in most countries). However, the results point to the importance of access to credit on economic growth: if access to credit does not have impact on growth through trade, the direct impact of access to credit is large with an estimated coefficient of 0.13 (significant at the 90% confidence level).

Table 2. Results for landlocked countries

	Openness	Exports	Imports
Loggdp1	0.012	-0.013	0.028
	(0.0237)	(0.0255)	(0.0311)
l_roadkm2	0.092***	0.070*	0.152***
	(0.0281)	(0.0381)	(0.0347)
l_roadpaved	-0.181***	-0.191***	-0.251***
	(0.0431)	(0.0501)	(0.0483)
l_air_trans_carr_dep	-0.047	-0.191	-0.251***
	(0.0546)	(0.0591)	(0.0483)
l_electric_cons_percap	0.180***	0.397***	0.058
	(0.0265)	(0.0308)	(0.0388)
l_dom_credit	-0.040	-0.054	-0.026
	(0.0413)	(0.0494)	(0.0475)
Simple_average3_mfn	-0.016***	-0.011	-0.018**
	(0.00535)	(0.00837)	(0.00848)
l_gfcf1	0.461***	0.306***	0.533***
	(0.0712)	(0.0853)	(0.111)
l_reer	-0.922***	-0.860***	-0.843***
	(0.131)	(0.214)	(0.231)
Constant	-10.77***	-12.43***	-10.66***
	(0.764)	(1.005)	(1.089)
Observations	66	67	66
R-squared	0.922	0.949	0.780
Trade variable in growth estimate	0.163	0.173	0.179
	(0.189)	(0.193)	(0.217)

Source: Authors' calculations.

Investment is sensitive to the macroeconomic environment, access to credit, governance issues, and the business environment. Estimations show that policies conducive to higher investment would have a sizable (and statistically significant at the 99% confidence level) impact on trade performance of landlocked countries. A 10% increase in the investment rate results in an increase in the openness ratio of almost 5 percentage points. As for the unrestricted sample, this impact is larger for imports than for exports.

In sum, results show that better domestic policies would make an important contribution to landlocked countries' trade performance. Restrictive trade policies

(measured by the customs tariff) seem to have slightly more impact on trade performance of landlocked countries than in other countries. Better macroeconomic policies would also contribute to better economic performance. In this context, the focus should be more on exchange rate policy than on fiscal policy. Policies fostering investment will also have an impact. This impact is large and slightly smaller compared to the unrestricted sample. Turning to policies that appear to have no impact on trade performance, in contrast to the results for the unrestricted sample and results from the *Enterprise Surveys*, access to credit does not appear to explain the poor trade performance of landlocked countries. Although the results are fragile there is evidence that this is also the case for fiscal policy.

4.2 Infrastructure alone is not sufficient: The importance of complementary policies

Exporters in landlocked countries rank electricity as their main business constraint (Figure 4), although it is perceived as less a severe constraint than in other countries. On average, 41% of firms in landlocked countries report electricity as a constraint compared to 49% in SVES, 46% in commodity exporters, and for all developing countries 43%. Moreover, Appendix 8 shows that electricity is most cited as the main constraint to business before access to credit in all country groupings except for landlocked countries. In landlocked countries, access to finance is more mentioned more frequently as the main constraint before electricity.

In contrast with the results for the unrestricted sample (Table A4.2), availability of electricity is more a constraint than its reliability. Because of data problems, the estimation for the impact of the reliability of electricity is based on a very small number of observations and the results are fragile (Table A.5.1). Reliability of electricity appears to be a statistically significant problem only for imports. In contrast, availability of electricity is a large and statistically significant constraint to trade, particularly for exporters. Tables 2 and A5.1 show that a 10% increase in the availability of electricity would result in an increase of the openness ratio by 2 percentage points, by 4 percentage points of the exports-to-GDP ratio (these estimates are significant at the 99% confidence level), but of less than 1 percentage point of the imports-to-GDP ratio.

Transportation problems are one of the main constraints highlighted by exporters in the *Enterprise Surveys*. It is reported to be more severe than in all developing countries or any of the other country groups (Figures 3 to 5 and 12). However, "transportation problems" is a term which can define many different issues.

First, transportation can be a problem because of *transport costs* due to the long distance to reach a seaport. Landlocked countries face a longer inland transportation distance than other countries. This is an important consideration given that overland distances are more penalizing than sea distances because of the higher cost per mile. Limão and Venables (2001) estimate that overland transport costs rise by as much as USD 1 380 per 1 000 km compared to USD 190 for overseas transport. One should note the large variability in the overland distance to the sea faced by the landlocked countries. For example, central Asian countries are far more remote from the sea than other landlocked countries (Grigoriou, 2007). However, Limão and Venables (2001) have shown that landlocked situations increase transport costs by more than what can be explained by the additional distance alone. Indeed, they emphasized that distance explains only 10% of changes in transport costs.

Second, transport can be problematic as a result of *poor infrastructure*. According to Limão and Venables (2001) poor road infrastructure represents 40% of the transport costs predicted for coastal countries and 60% for landlocked countries. In addition, port infrastructure and efficiency, and the transportation infrastructure in a transit country can be problems (Hummels, 2001, Grigoriou, 2007, Raballand and Macchi, 2008, Raballand *et al.* 2008, and Djankov *et al.*, 2010). A key factor for trade is the road corridor linking the main economic center of a landlocked country to the seaport. The impact of the road corridor, an important component of Aid for Trade,[32] is not captured by the variable used here.

Third, transportation problem can refer to costs associated with the *time* needed to trade and the uncertainty associated with the time needed to trade. This implies both a hedging and a depreciation cost in addition to a barrier to export diversification as a landlocked country cannot engage in the production of time sensitive goods or in the production of part of goods that are internationally fragmented (Hummels, 2001, Grigoriou, 2007, Raballand and Macchi, 2008, Raballand *et al.* 2008). The findings of Freund and Rocha (2010) provide a useful quantification of the time cost of trade. They estimate the impact of time on exports of 44 sub-Saharan African countries using a gravity model. They show that the assumption that a one day delay affects exports the same way no matter when it occurs is incorrect. More specifically, they distinguish three sources of delays: inland transit, documentation, and ports and customs delays. They find that the negative impact on trade of transit delays is nearly four times larger than delays due to documentation or ports and customs. Reducing by one day the inland travel time leads to a 7% increase in exports for all countries, but to a 9% increase in exports for African landlocked countries. They explain this finding by the fact that in addition to delay costs, there is a cost associated with the uncertainty of the delay. They conclude that "problem for inland transit lies in the quality and security of the roads, border delays and the efficiency of security checkpoints, the age of the truck fleet and competition in trucking. These are factors which are more closely linked with institutions than geography." This highlights the potential of trade facilitation programmes.

Fourth, and related to the problem of time cost of landlockedness and the findings of Freund and Rocha, is the time spent at *official and unofficial roadblocks* (including border crossing) *as well as unofficial payments*. These costs can be very large as illustrated by Map 1 (Grigoriou, 2007; Raballand *et al.* 2008).

Finally, even if infrastructure is of good quality in both the landlocked country and the transit country and transport is free of useless roadblocks and unofficial payments, transportation can be a problem because of insufficient logistics, regulations or because of uncompetitive practices (Arvis *et al.*, 2007; Raballand and Macchi, 2008; and Hoekman and Wilson, 2010). For example, in a study on the impact of road corridors in Africa, Raballand and Macchi (2008) show that road constructions and improvements, often financed by foreign aid, helped to reduce inland transportation time faced by traders in landlocked countries and contributed to reducing transport costs. However, administrative time remains a problem and the authors show that because of lack of competition and domestic regulations implemented to protect trucking operators in landlocked countries, the reduction in transport costs was not passed to customers. In other terms, infrastructure investment reduced the transport cost but did not result in a significant change in transport prices which is the trade cost faced by importers and exporters in landlocked countries. Moreover, logistics services are crucial and can be problematic in many countries. Hoekman and Wilson (2010) summarize the issue as follows: "While improved infrastructure is clearly a priority in many countries, investment in infrastructure must be

accompanied by measures that reduce trade costs and by appropriate regulation—for instance, policies that promote competition in transport services and improvements in border management. The quality of public and private services can be an important determinant of the size of the payoffs to improvements in hard infrastructure. In addition, the efficiency, variety and costs of services inputs are critical for the competitiveness of firms and farmers because they represent an important share of the total costs of production."

Map 1. Check Points, Bribes, and Delays on West Africa Road Corridors
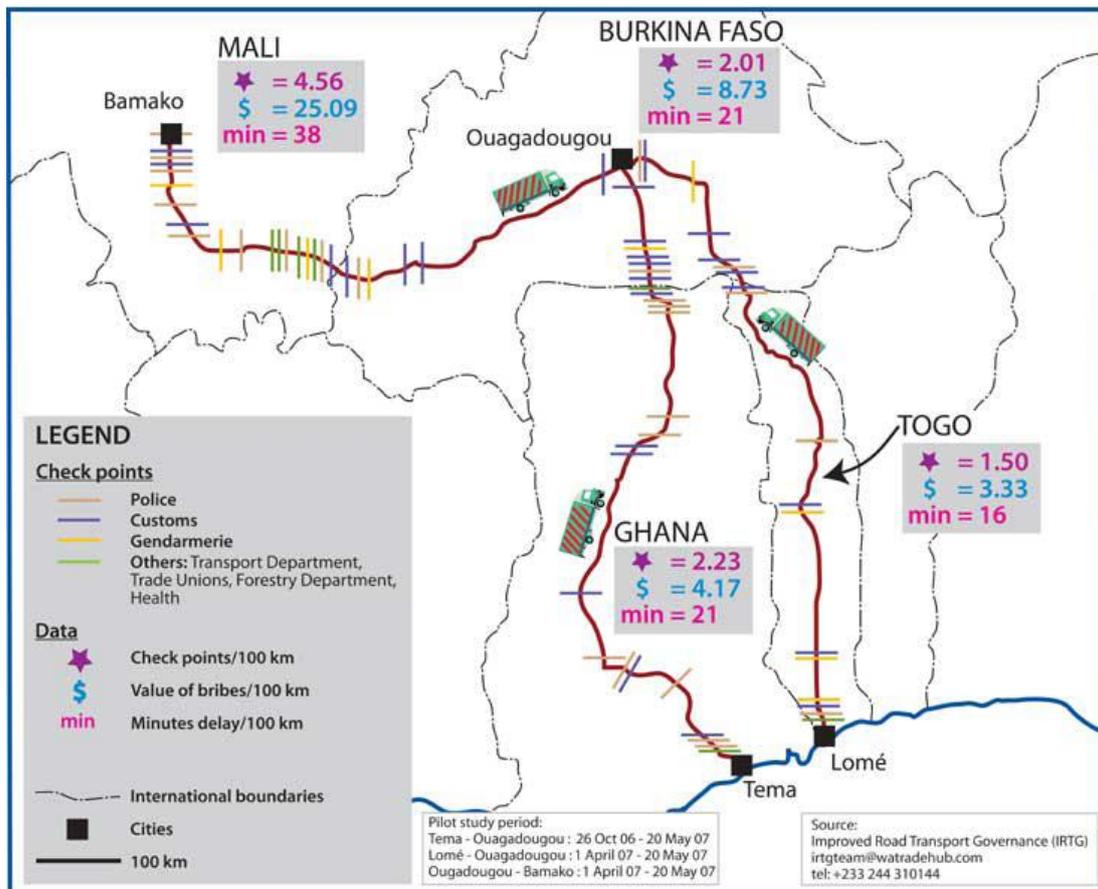
Source: www.watradehub.com quoted in Raballand *et al.* (2008).

Due to data limitations, econometric work cannot analyze the relevance and relative importance of the many explanations of why landlocked countries trade much less than is explained by distance to the sea and why transportation is a major problem.[33] This is also an extensive agenda that would warrant a study on its own. The Uganda and the Azerbaijan case studies provide a more in-depth discussion on their relevance.[34]

In this paper, we focus on the impact and the role of transportation infrastructure, which is found to be a significant constraint to trade in the unrestricted sample and to have an important impact on economic growth. For landlocked countries, it is necessary to realize that transportation infrastructure covers both domestic infrastructure that the landlocked country's government can change, and transit country infrastructure and port infrastructure that the landlocked country government cannot change. For this reason, but

also because we try to identify the supply-side constraints that government can address, we will focus on the *domestic* infrastructure keeping in mind that the literature has shown that transit infrastructure has a major impact on landlocked countries trade. This is illustrated in the Uganda case study.

Table 2 suggests that *domestic* transportation infrastructure is not a significant constraint to landlocked countries' trade, be it imports or exports. As mentioned above, this conclusion was also reached by Agboghoroma *et al.* (2009) for all types of countries. But, as this result contrasts with the findings for the unrestricted sample and has strong policy implications, including for the design of aid-for-trade projects and programmes, the robustness of these results has been checked with the use of as many variables as possible. These alternative estimations are presented in Appendix 5 and show that this conclusion is robust to alternative transportation variables and specifications.

First, we focus on alternative road variables (Table A5.3). Considering road quality (percentage of road that are paved) instead of road quantity (density of the road network), increases the number of observations and shows a bigger impact of trade on economic growth. The insight on the importance of domestic policies remains valid. However, quality of road appears to have not only a minimal but also a negative impact on trade. Considering simultaneously the two road variables does not affect the conclusion of the domestic policies but shows the robustness of the results presented in Table 2. The impact of road quantity on trade increases dramatically and becomes highly significant on all three trade variables. However, the impact of road quality remains negative (and significant) offsetting the impact of road quantity. Alternative specifications such as adding electricity variables and fiscal variables (Tables A5.1 and A5.2) provide additional evidence of the robustness of the conclusion to different specifications: results do not show any significant impact of *domestic* road infrastructure on landlocked countries performances whatever the variable considered or the specification.

Second we look at the impact of alternative mode of transportation. If domestic road infrastructure does not have any impact what about other transportation infrastructures such as air and rail? Air-shipment could be a means for landlocked countries to bypass inland and shipment problems, to trade more quickly and thus to diversify exports into some perishable and time sensitive exports. However, air transportation is rarely used to trade in most developing countries[35] and there is scant evidence of the role this mode of transportation played in boosting landlocked countries' trade. One of the few examples is the rapid increase in the 2000s of (airlifted) cut flowers exports by Uganda and Ethiopia. Cut and dried flower exports, which were only the 54th largest export products of Ethiopia in 2001 (with a negligible export value of USD 174 000), became the 4th largest export products in 2008 (with an export value reaching USD 104.74 million). Uganda's exports of flowers were such a success in the late 1990s and early 2000s that it prompted Ethiopia to enter the market. However, Uganda's exports of cut flowers collapsed after 2003 because of the combined effect of a sharp increase in oil price and thus in transport costs and because of emerging competition of high quality flowers from Ethiopia. Ethiopia's exports were not affected by the oil price shock because of their high quality and thus higher commercial value, but also because of government subsidies and foreign aid support (Easterly and Reshef, 2010). Table 2 suggests that air transport infrastructure does not represent a significant constraint to trade. Considering air transport as the only transportation variable leads to a big increase in the number of observations (Table 3) and provides greater confidence in this finding.

Rail appears to be a better alternative transport mode than air for landlocked countries, at least for central Asia. Grigoriou (2007) as well as Raballand *et al.* (2005) have shown that railroads are crucial for central Asia's trade, although the rail density is particularly small for the region. Indeed, approximately 90% of total freight transport in Central Asian countries during 2000 was by rail. Table 3 suggests that rail infrastructure has a positive and highly significant impact on openness only through its impact on imports. Considering, in addition to the rail infrastructure, road quantity or road quality (not shown) leads to an offsetting effect and the combined impact of road and rail infrastructure is close to zero providing additional support to the fact that domestic transportation infrastructure does not explain the trade performance of landlocked countries.

Table 3. Results for landlocked countries (rail and air variables)

	Air infrastructure			Rail infrastructure		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.039**	-0.024	-0.054**	-0.039**	-0.037*	-0.059***
	(0.0191)	(0.0226)	(0.0231)	(0.0173)	(0.0185)	(0.0205)
l_air_trans_carr_dep	-0.013	0.033	-0.064			
	(0.0340)	(0.0460)	(0.0447)			
l_railkm2				0.075***	-0.050**	0.181***
				(0.0256)	(0.0245)	(0.0326)
l_electric_cons_percap	0.219***	0.364***	0.134***	0.155***	0.434***	-0.020
	(0.0195)	(0.0283)	(0.0239)	(0.0238)	(0.0272)	(0.0344)
l_dom_credit	-0.039	-0.085**	-0.000	-0.129***	-0.124***	-0.180***
	(0.0289)	(0.0406)	(0.0354)	(0.0353)	(0.0388)	(0.0476)
Simple_average3_mfn	-0.009**	-0.013*	-0.006	-0.014**	-0.006	-0.016**
	(0.00449)	(0.00808)	(0.00476)	(0.00533)	(0.00863)	(0.00678)
l_gfcf1	0.331***	0.222**	0.367***	0.676***	0.496***	0.885***
	(0.0545)	(0.0867)	(0.0784)	(0.0815)	(0.0922)	(0.112)
l_reer	-0.650***	-0.711***	-0.571***	-0.588***	-0.607***	-0.552***
	(0.145)	(0.196)	(0.134)	(0.116)	(0.195)	(0.131)
Constant	-12.55***	-14.40***	-12.39***	-12.86***	-15.80***	-11.90***
	(0.839)	(1.108)	(0.896)	(0.723)	(0.872)	(0.890)
Observations	153	154	154	59	60	59
R-squared	0.835	0.841	0.632	0.933	0.966	0.830
Trade variable in growth estimate	1.176 (0.936)	1.077 (0.903)	1.341 (1.059)	0.755 (0.469)	0.725 (0.481)	0.804 (0.510)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

5.   Results for small and vulnerable economies (sves)

The subsample for SVEs is heterogeneous in the sense that it is represented mainly by a group of landlocked countries and island nations. No official definition of SVEs exists. At the Hong Kong Ministerial, in a Communiqué (WTO, 2005b), 28 WTO members defined themselves as SVEs. Signatories of the Hong Kong Communiqué on SVEs are heterogeneous in terms of world market share or population and not all countries that would qualify as SVEs are signatories of the Communiqué.

This report tried to establish objective criteria to define SVEs which should cover the signatories of the Hong Kong Communiqué. Following the logic exposed in Corrales-Leal *et al.* (2007), we defined SVEs as countries whose share in global market does not exceed 0.12% and whose population does not exceed 15 million.[36] According to these criteria 61 ODA eligible countries are defined as SVEs; 49 have a population of under 10 million and 12 have a population between 10 and 15 million. Data availability allowed for an econometric simulation of the binding constraints to trade for 36 of these countries (Appendix 3), 27 of which have a population under 10 million and 9 between 10 and 15 million.

5.1   The specific trade related issues faced by SVEs

Core results for the unrestricted sample suggest that small and vulnerable economies are slightly more open than the average developing countries. The dummy is positive but small and not statistically significant. This result should be interpreted as showing that SVEs are more open to trade because of their smaller size. In particular, their size limits the diversification of production and requires imports resulting, other things being equal, in a larger import-to-GDP ratio. As imports need to be paid for, these results in a larger than average export-to-GDP ratio. In short, the dummy does not point to specific supply-side problems but to the fact that SVEs need to trade more than larger developing countries because of their smaller size. As a result they tend to have larger openness ratios by about 2.5% of GDP compared to other countries (Table 2).

The specific constraints faced by SVEs are analyzed in this report because SVEs have received the focus of the international community. The specific problems of SVEs have been recognized by the aid-for-trade community. In his closing remarks at the Second Global Review of Aid for Trade WTO DG Lamy (2009) indicated "We also learnt that Aid for Trade needs to factor in specificities; for example, those of middle-income countries and the types of financing available to them; or those of landlocked countries, small economies, remote islands or countries emerging out of conflict." The WTO Committee on Trade and Development as part of its work on Aid for Trade dedicated a seminar in February 2011 to the SVEs. The trade community also recognizes the specific challenges faced by the SVEs. For example, paragraph 35 of the Doha Declaration mandates the General Council to examine the SVEs' problems and to make recommendations as to what trade-related measures could improve the integration of small economies into the multilateral trading system.[37] In the Hong Kong Ministerial Declaration, WTO members "reaffirm our commitment to the Work Programme on Small Economies and urge Members to adopt specific measures that would facilitate the fuller integration of small, vulnerable economies into the multilateral trading system, without creating a sub-category of WTO Members." (WTO, 2005a).

What are the specific trade-related needs of SVEs? According to the signatories of the Hong Kong Communiqué, SVEs have many trade-related needs in common "such as minimal share of total world trade; physical isolation, geographical dispersal and distance from the main markets; high transport and transit costs; small, fragmented and highly imperfect markets; minimal or no export product diversification; dependency upon very few export markets and lack of adequate market access opportunities; high degree of vulnerability; low competitiveness; considerable difficulties to attract foreign investment; and susceptibility to natural disasters" (WTO, 2005b).

Calì and te Velde (2009) elaborate arguing that domestic market size is limited due to the small population. As a result, most of the firms in SVEs cannot benefit from economies of scale and face problems in innovation. Indeed as mentioned in Bloom *et al.* (2011) a small market size does not allow spreading the fixed cost of investing in new technologies. The small size problem is compounded by the fact that most SVEs are remote from the main markets. It is noteworthy to add that exports can be a way to extend the market size and thus benefit from economies of scale. Most SVEs have a poor investment climate, weak institutions, and lack skilled labor or adequate human capital, which also limit access to external capital and constrain industrial development.

The competitiveness of SVEs in world markets is thus affected by high unit production costs for firms in these countries. In addition, remoteness, landlockedness and insularity of many small states mean that transportation costs and time costs are high. As a result, SVEs have a strong export concentration because they tend to be excluded from the trade of time-sensitive goods and from a major source of growth in international trade: the production of internationally fragmented product parts.

There is a link between the challenges of being small and vulnerability. As indicated in Hallaert and Munro (2009), there is strong empirical evidence that export concentration has a negative impact on economic growth. This is due in part, to the fact that it is more difficult to face the volatility of international markets when the export basket is limited. Volatility in international prices affects small countries through the import channel. Finally, because small economies depend more on trade than larger economies and do not have the domestic capacity for import substitution, it is difficult to absorb the fluctuations in international prices.

Turning to the exporters' perception of the main business constraints (Figure 5), as for other country groupings, electricity is the most severe problem reported by exporters of SVEs. The severity of the electricity problem in SVEs appears to be larger than for any other group: 49% of exporters mention it as the main constraint compared to 43% for the unrestricted sample, 41% for landlocked countries or 46% for commodity exporters. Transportation problems appear more severe than average and only smaller than in landlocked countries, while access to credit appears to be less of a constraint on exporters' activities than average (but more severe on non exporters).

Figure 5. Surveys of Business Constraints in Small and Vulnerable Economies

Per cent of firms mentioning the topic as a constraint
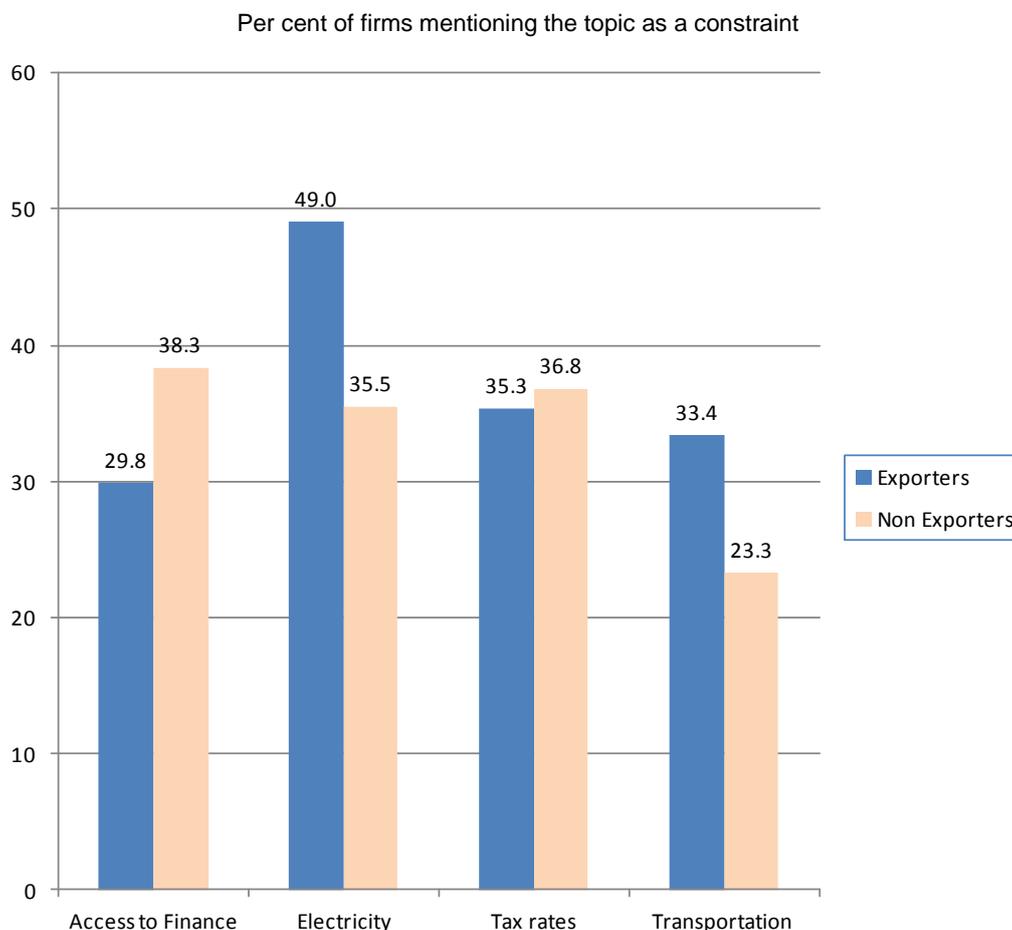
Source: Author's calculations based on World Bank (2010).

5.2   *Trade a necessity and an engine for growth*

SVEs are open to trade by necessity. Their small size limits their production capacity and market. Core results presented in Table 4 show that the consequences of being small and often remote from the main market have a severe impact on trade performance.

- Export concentration reduces considerably the SVEs openness. This coefficient is highly statistically significant. Calì and te Velde (2009) calculate that for most economies in the Pacific and Caribbean regions, the combined share of the two most important commodities/services is over 50% in total exports of goods and services. Measured by the Herfindhal index calculated at HS-4 digits level, SVEs' export concentration during 2000-2007 reached on average 0.176 which is much higher than the concentration index for all non SVEs (0.145) or LDCs (0.127).

- The small size of the labor force is a major and statistically significant constraint. A 10% increase in the labor force increases the openness ratio by at least 3% of GDP. Alternative specifications show an impact that can be as high as 5% of GDP. Productivity per worker, when added to the model, cut by half the number of

observations. Results are thus more fragile, but suggest that the impact of increased productivity though positive is small and statistically not significant.

Table 4. Results for Small and Vulnerable Economies

	(1)			**(2)**		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.135*	-0.120	-0.166***	-0.163	-0.209	-0.145
	(0.0706)	(0.0949)	(0.0622)	(0.117)	(0.160)	(0.105)
l_roadpaved	0.328***	0.219	0.383***	0.495***	0.422**	0.538***
	(0.121)	(0.147)	(0.110)	(0.162)	(0.0306)	(0.151)
l_electric_cons_percap				0.082	0.175*	0.016
				(0.0753)	(0.0948)	(0.0767)
l_dom_credit	0.309**	0.304*	0.313***	0.360**	0.366*	0.343**
	(0.127)	(0.157)	(0.111)	(0.155)	(0.202)	(0.132)
Simple_average3_mfn	0.003	0.003	0.005	-0.003	-0.001	-0.004
	(0.0102)	(0.0125)	(0.009)	(0.0247)	(0.0287)	(0.0223)
l_gfcf1	0.390*	0.466*	0.379**	0.157	0.067	0.215
	(0.202)	(0.259)	(0.179)	(0.311)	(0.365)	(0.294)
l_property_rights	0.127	0.531**	-0.0673	0.129	0.589***	-0.0485
	(0.162)	(0.210)	(0.149)	(0.168)	(0.224)	(0.159)
l_l_force	0.301**	0.412**	0.255**	0.341*	0.600**	0.232
	(0.138)	(0.166)	(0.124)	(0.185)	(0.237)	(0.170)
l_reer	-0.420	-0.475	-0.241	-0.910	-0.864	-0.784
	(0.437)	(0.568)	(0.385)	(0.566)	(0.716)	(0.512)
l_government_spending	-2.108***	-2.313***	-1.926***	-2.264***	-2.448**	-2.145***
	(0.662)	(0.744)	(0.607)	(0.803)	(0.964)	(0.727)
l_herfindhal	-0.654**	-0.615*	-0.738***	-1.107***	-0.839*	-1.328***
	(0.266)	(0.313)	(0.278)	(0.403)	(0.498)	(0.465)
Constant	-9.345***	-12.460***	-9.691***	-7.676**	-12.160**	-7.679**
	(3.104)	(4.107)	(2.650)	(3.815)	(5.274)	(3.382)
Observations	174	177	175	123	123	124
R-squared	0.323	0.259	0.371	0.396	0.326	0.441
Trade variable in growth estimate	0.099**	0.119	0.091**	0.060*	0.068*	0.058**
	(0.0467)	(0.0723)	(0.0378)	(0.0606)	(0.0715)	(0.0613)

Source: Authors' calculations.

This does not imply that trade cannot be a source of growth. On the contrary, estimates show that increasing by 10% the SVEs openness ratio increases their economic growth rate by 0.6% to 1.1% and is often significant at the 90%-95% confidence level (Table 4 and Appendix 6). This impact, which is robust to various specifications,[38] is similar to the one reported for the unrestricted sample.

5.3   Infrastructure is a key determinant of SVEs trade performance

Transport infrastructure. It is widely assumed that transport infrastructure is crucial to address the remoteness, landlockedness, and insularity problems of many SVEs which are a source of high transportation costs and long time needed to trade which lead to high export concentration. Estimations confirm that transport infrastructure is crucial to the trade performance of SVEs. The quality of road infrastructure has a large effect on trade openness: a 10% increase in paved roads increases openness by 3% to 5% of GDP. This result, which is significant at the 99% confidence level, is very large (4 to 5 times larger than for the unrestricted sample) and appears to be larger for imports than for exports though it remains substantial for the latter. Table A6.1 shows that the trade impact of the road infrastructure is not limited to the quality but depends also to a lesser extent on its quantity. A 10% increase in road density increases openness by about 2% of GDP. This impact is statistically significant and again appears larger on imports than on exports, and is twice as large as for the unrestricted sample. In contrast, air transport infrastructure does not appear to have an impact (not shown). The impact of roads on growth is substantial: a 10% increase in the quality of roads is estimated to increase the economic growth rate by almost 0.4% of which 30% is due to the impact through trade.

Electricity. Electricity is the main business constraint expressed by SVEs' exporters. Table 4 shows that the impact of the availability of electricity is only significant for exports and is much smaller than the impact of road infrastructure. Table A6.2 suggests that the problem with electricity is, as for the unrestricted sample, associated with the reliability of electricity. The impact is very large (almost equal to the impact of road quality) and significant affecting mostly exports. An illustration of the impact of electricity, including on exports diversification of an SVE, is provided in Box 1.

Telecommunication infrastructure. While the telecommunication infrastructure does not appear to explain trade performance in the unrestricted sample, Table 4 shows that it contributes to help SVEs increase trade. This may be because telecommunications help overcome remoteness, landlockedness, and insularity problems. Table A6.3 shows that increasing the number of fixed telephone line per 100 inhabitants increases the trade openness ratio by 0.2% because of its large impact of 0.4% on the export ratio. The impact is statistically significant. Other telecommunication variables, such as the number of cell phone subscribers per 100 inhabitants or the total number of phones (fixed and mobile) per 100 inhabitants, have been tested but their impact is not statistically significant. This is perhaps because the development and diffusion of mobile telephone occurred late in the period under consideration. The impact of the telecommunication infrastructure remains limited not only on imports but also on economic growth: a 10% increase in the telecommunication infrastructure is estimated to increase the economic growth rate by 0.03% of which about half is through trade.

5.4   Domestic policies: Diversification and access to credit

A supportive macroeconomic environment is essential for the sustainability of trade reform (Hallaert, 2010). While the impact of the mismanagement of the exchange rate has a significant negative impact on export performance of both the unrestricted sample and the landlocked countries, its impact appears more limited in the case of SVEs and is not statistically significant. The impact of government spending remains significant at the 99% level of confidence and its magnitude is larger than for the unrestricted sample. This

may reflect the impact of taxation which is reported by exporters as a major constraint to their activities (Figure 5).

While cutting tariffs in landlocked countries (and for the unrestricted sample) has a small but statistically significant impact on both exports and imports, a tariff reform in SVEs is close to zero and not statistically significant. This result is robust when considering applied tariff rather than MFN tariffs. It does not appear to be due to the fact that the tariff rate is very low or lower than in other countries (over the period 1981-2009, the simple average tariff for the SVEs was 16.5% compared to 15.5% for the landlocked and 21.5% for the unrestricted sample).

Core results highlight that focusing on complementary policies will have the biggest impact. The main binding constraint is export concentration. All policies (and Aid for Trade) helping to build productive capacities are likely to have a large impact. Hallaert and Munro (2009) show that making export diversification one of the main objective of Aid for Trade is economically grounded as literature provides evidence that export diversification helps limit volatility, which has a negative impact on economic growth.[39]

Access to credit is, after export concentration and transport infrastructure, the third largest constraint to trade performance. Its impact is large and larger than in the unrestricted sample. A 10% increase in credit to the private sector would increase all trade ratios by 3% to 4% of GDP. In contrast with the findings for the unrestricted sample, the impact of deepening the financial sector increases exports and imports ratios. Finally, the trade impact of improving property rights is similar in magnitude to the unrestricted sample. Improving property rights is particularly important for export performance and could help diversify exports, although, as mentioned above, measures aimed at increasing labor productivity appear to have a limited and not statistically significant impact.

6.   Case study — Uganda: a landlocked, small and vulnerable economy

The experience of Uganda with trade reforms highlights two import points. First, it is important to identify the most binding constraint to trade to have a meaningful impact on trade and on growth (Hallaert and Munro, 2009 and Hallaert, 2010). This is done by analyzing the reasons for the failure of the 1990s reforms and the success of the trade reforms of the 2000s. Second, Uganda shows the importance of factors such as corridors, time costs, regulation of the transport sector, and customs procedures that could not be captured by the analysis of the landlocked countries and could explain why the transport infrastructure variables did not explain trade performance.

Uganda is a good example of a landlocked country where the importance of identifying priority areas can be investigated. This case study shows, by comparing the failure of the reforms of the 1990s with the success of the reforms of the 2000s, the importance of identifying the most binding constraints in order to adequately sequence the reforms. It also provides an illustration of the importance of the complementary policies. The case study argues the trade reforms of the 1990s did not result in trade expansion and economic growth because they did not address the most binding constraints (they were limited to MFN tariff reforms). This contrasts with the broader reforms of the 2000s, which were successful in leading to a sharp increase in trade and a significant export diversification (both in terms of products and markets).

6.1   Failure in the past: tackling the wrong binding constraints

During the 1990s, Uganda substantially liberalized its trade regime, while maintaining a high level of macroeconomic stability. The tariff structure was simplified, the average import tariff dropped from 17% in 1994 to 9% in 2000 (Figure 6) and taxes on exports were eliminated. While these policy measures were expected to stimulate the economy, economic growth was disappointing (Figure 7).

Figure 6. Uganda - Applied MFN tariffs (simple average, 1994-2009)
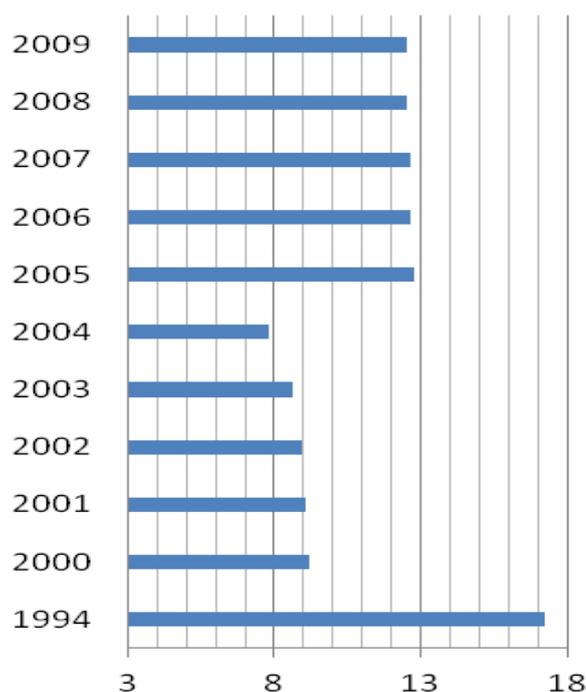
Source: UNCTAD-TRAINS database.

According to Milner *et al.* (2000), and consistent with the econometric results, this disappointing growth impact could be attributed to the fact that the trade regime was not the main constraint on trade. One of the biggest constraints to trade was the high transport costs. Milner *et al.* (2000) estimate that the implicit taxation of exports from Uganda reached 77% in 1994; 64% was due to overland and sea transport and only 13% was associated with customs tariffs.

Time is another major constraint to Uganda's trade. For example, Djankov *et al.* (2010) calculate that if Uganda reduces its factory-to-ship time from 58 to 27 days, exports may potentially increase by 31%. Consistent with the literature on the impact of time delays on trade (Section 4), they also find that time delays have a much bigger impact on exports of time-sensitive goods, such as perishable agricultural products.

In addition to high transport costs and time costs, unpredictability in the delays and inaccurate information hamper competitiveness in the global market. The role of uncertainty did not receive much attention but Arvis *et al.* state (2010) that "transportation costs only explain one part of the real impact of being landlocked. Delays and even more importantly low degree of reliability and predictability of services create

massive disincentives to invest and higher total logistics costs," and, as a result, "are even more important in constraining their trading and thereby growth prospects."

Figure 7. Uganda - GDP per capita and trade openness (1994-2008)
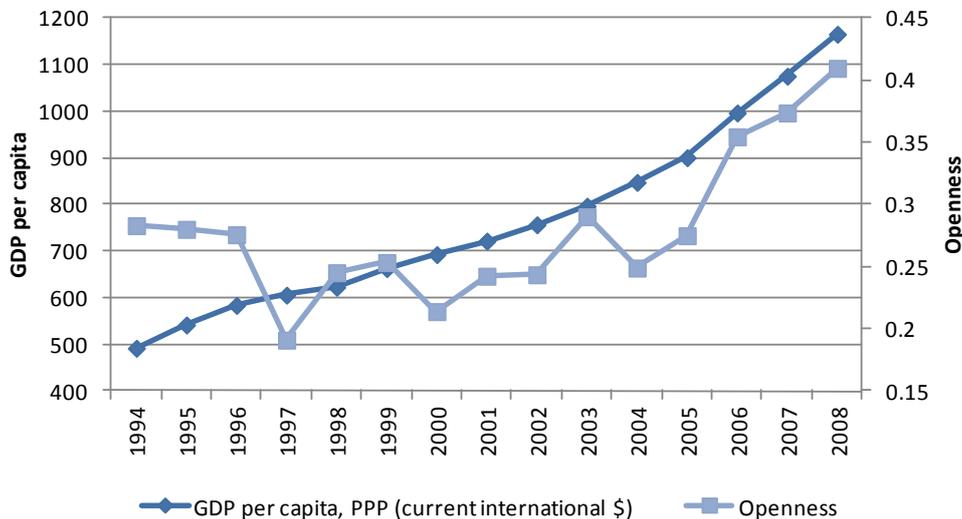
Source: Authors' calculations based on WDI and COMTRADE databases.

The trade reforms of the 1990s did not result in trade expansion and economic growth because Uganda did not address the most binding constraints and focused on the less binding problem. Being a small landlocked country, the bigger constraints to trade were the costs of transport, time, and uncertainty and not the trade regime. This experience highlights the importance of the right sequencing of reforms and to identify the most binding constraints. It also highlights the need to properly identify the most binding constraints as priorities, on which donors commit under the Paris Declaration on Aid Effectiveness (2005) to align their support, may differ from the most urgent trade-related needs.

6.2   Sources of the success of the recent reforms

In the 2000s, Uganda launched a broader successful package of reforms that used trade as an engine for growth. These reforms diversified exports (an important objective of the Aid for Trade Initiative), reduced transport costs, and time to trade.

Export diversification

Regional integration has played a pivotal role in diversifying exports and, reducing transport costs, including transit times. Uganda has actively participated in regional trade agreements notably the Common Market for Eastern and Southern Africa (COMESA) and the East Africa Community (EAC).[40] Traditionally, the European Union was the largest market for Uganda, but COMESA countries have taken over the European Union. In 2007, COMESA constituted 37.9% of total export and the European Union accounted for 24.3% (UBOS). The increase in exports to the EAC is reported in Figure 8. As a result of regional integration, Uganda has been able to improve access to the sub-Saharan African markets and trade with these countries has substantially increased. It is

noteworthy that regional integration coincided with an increase in inward foreign direct investment which almost tripled from USD 295 million in 2004 to USD 799 million in 2009 (UNCTADstat).

Figure 8. Uganda - Export to the World and to the EAC (1994-2008)
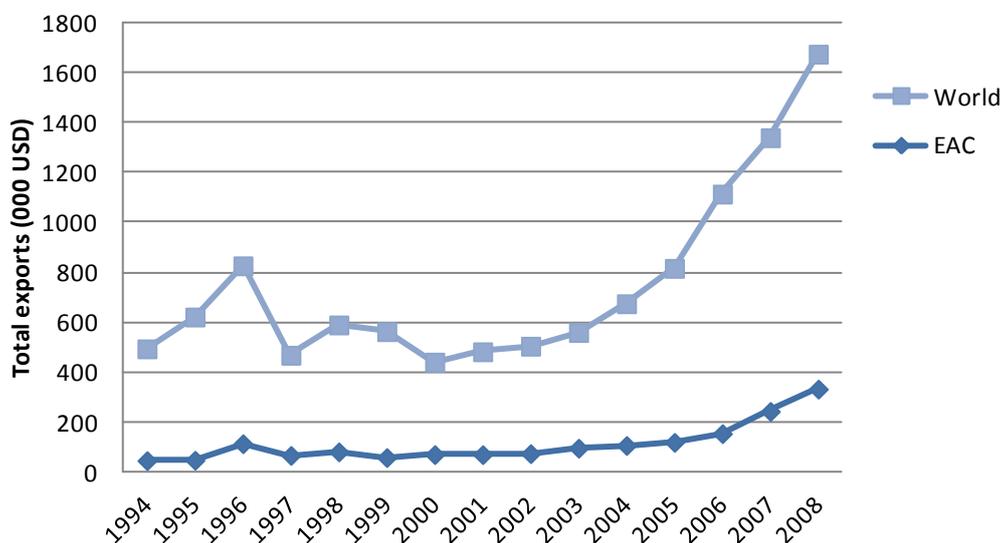
Source: Authors' calculations based on COMTRADE data.

Product concentration is as important as geographical concentration. Hallaert and Munro (2009) emphasize the need to differentiate export product concentration from geographical concentration because the two have separate sources of vulnerabilities. Traditionally, coffee has been Uganda's main export. As illustrated in Table 5, export receipts from coffee were the largest in both 1995 and 2008. However its importance has decreased in absolute and relative terms. Not only export receipts from coffee decreased over this period but, testifying to the diversification process, export receipt from coffee which in 1995 were twelve times larger than receipts from the second largest export commodity, were only four times larger in 2008. Non-Traditional Exports (NTE), such as flowers, fruits and vegetables, have taken over traditional exports since 2001 and the total share of export earnings from NTEs rose from 14% in 1991 to 70% in 2007.[41] The considerable diversification of exports protected the economy from the adverse effects of volatility in international prices of coffee and cotton as well as the unstable global economic conditions and contributed to GDP growth. Figure 9 shows the positive correlation between GDP per capita and export concentration during the period 1999-2008.

Joining the EAC was a big step forward in addressing the constraint of high trade costs on a regional level. Although the adoption of the EAC Common External Tariff in 2005 led to an increase in tariffs for imports to Uganda (Figure 6), exports continued to perform well (Figure 8) mainly because of the increased volume of intra-regional trade and improvement of customs processes and trade logistics.

Table 5. Uganda – Export diversification (in thousands of 2008 USD)

Products	1995 Rank	2008 Rank	1995 Value	2008 Value
Coffee	1	1	USD 487 662	USD 403 138
Fish	2	2	USD 39 211	USD 107 942
Gold	3	24	USD 36 160	USD 8 439
Maize (corn)	4	29	USD 26 199	USD 6 256
Vegetables, leguminous dried, shelled	5	18	USD 19 426	USD 13 569
Hides and skin	6	81	USD 13 384	USD 1 161
Tobacco unmanufactured	7	7	USD 12 378	USD 42 470
Cotton	8	154	USD 11,432	USD 268
Oil seeds and oleaginous fruits, nes	9	15	USD 8 506	USD 15 796
Soaps	10	13	USD 3 970	USD 20 584

Source: Easterly and Reshef (2010).

Figure 9. Uganda - Export Concentration and GDP per capita (1999-2008)
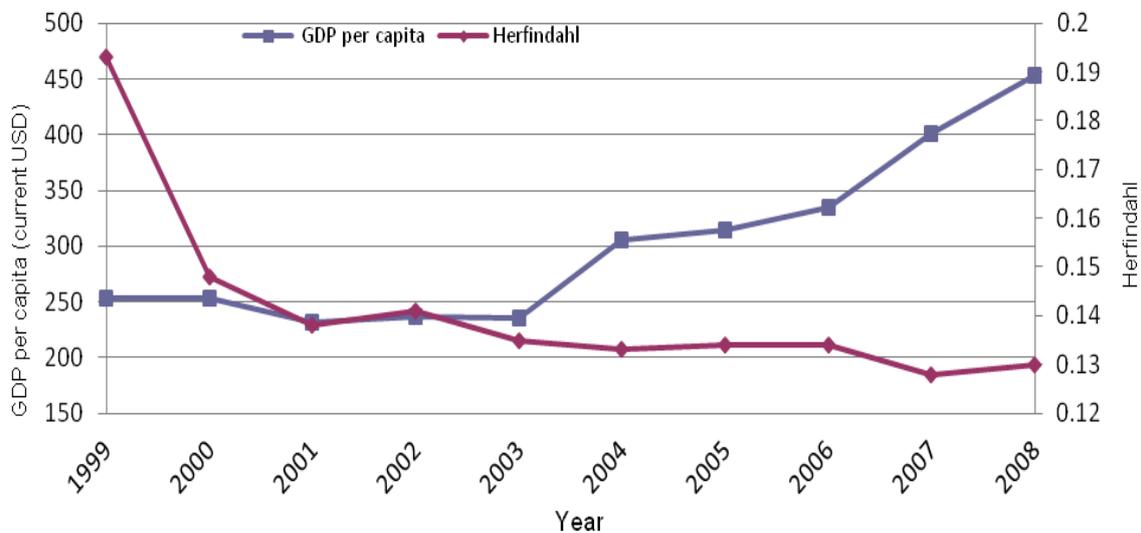
The Herfindhal index is calculated at the HS-4-digit level.
Source: Authors' calculation based on WDI and COMTRADE databases.

Transport and time costs

As discussed in Section 4, being landlocked has a significant effect in raising transport costs and despite efforts to reduce non-tariff barriers, freight costs remained high in the early 2000s. Updating the study by Milner *et al.* (2000), Rudaheranwa (2004) estimates that the implicit taxation of exports that arise from land transport costs represented 25% in 2003, down from 31% in 1994, while shipping costs rose from 32% in 1994 to 37% in 2000. A possible explanation for the improvement of land transport

costs may be the impact of increased regional trade and the improvement of the Northern Corridor.

As shown in Map 2, the Northern corridor links Burundi, the Democratic Republic of Congo, Rwanda, and Uganda to the Kenyan port of Mombasa. The Northern Corridor is vital for Uganda as 95% of its external trade passes through the port of Mombasa. Ninety per cent of this cargo travels by road along this corridor with the remaining 10% by rail (World Bank, 2011). As of 2006, various aid-funded projects, such as the World Bank's "East Africa Trade and Transport Facilitation Project," aimed at tackling the delays plaguing the Corridor. According to the World Bank (2001), these complementary policies led to a reduction in transit time at borders from three days to three hours, and in the transit time along the Mombasa-Nairobi-Kampala section of the corridor from fifteen to five days.

Map 2. The Northern Corridor Routes
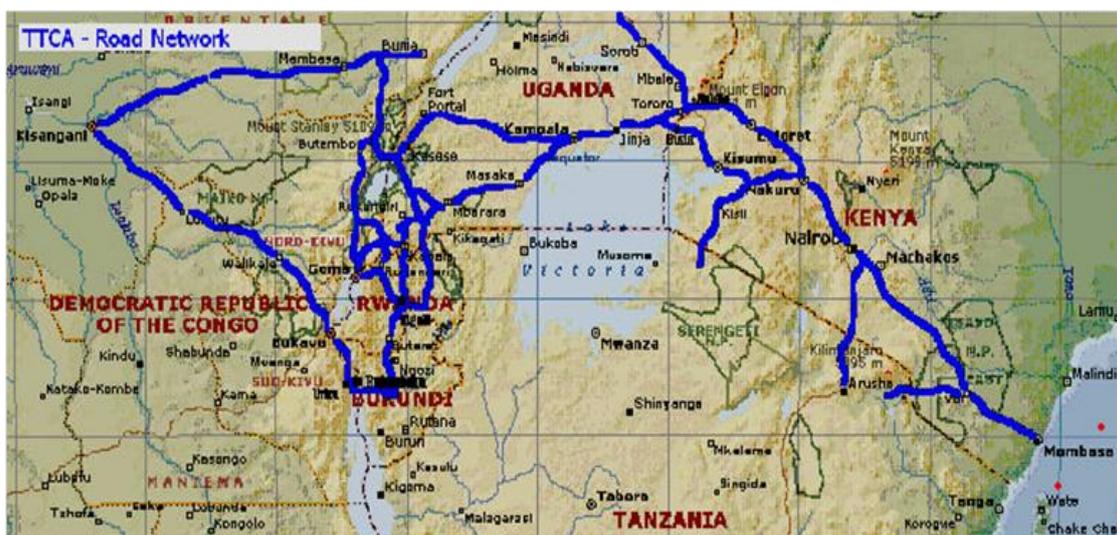
Source: Transit Transport Coordination Authority of the Northern Corridor (2004).

Another factor is that Uganda streamlined its customs procedures. Delays due to the massive number of documents and the time needed to export and import declined. According to the World Bank's *Doing Business* database,[42] the average number of documents to export and import a container declined from 11 to 6 and 18 to 8 respectively between 2006 and 2011. While 42 days were needed to export and 67 days to import in 2006, Uganda had reduced the time to export to 37 days and the time to import to 34 days by 2010.

Since the first report of World Bank's *Logistics Performance Indicators* (LPI), the LPI score for Uganda improved by 13%. As illustrated in Table 6, Uganda has made significant progress in upgrading its customs sub-index by 29% with a higher efficiency of the clearance process. The score for the international shipments sub-index, which represents the ease and affordability of arranging international shipments also improved by 25%. Progress has been more limited in improving infrastructure and shortening the time spent at border crossings with transport-related infrastructure and timeliness in reaching a destination increased by only 8% and 7% respectively.

Table 6. Uganda - Change in logistics performance indicators' score (2007-2010)

Economy	LPI	Customs	Infrastructure	International shipments	Logistics competence	Tracking & tracing	Timeliness
Uganda	13%	29%	8%	25%	2%	5%	7%
Sub-Saharan Africa	3%	-1%	-3%	6%	-2%	8%	6%
OECD Average	0%	0%	2%	-5%	0%	2%	1%

Source: Logistics Performance Index (www.worldbank.org/lpi).

All these improvements in time to trade are crucial as time delays associated with transport have a monetary cost which increases to the already high cost of transport. The quality of transport in Africa has improved since the mid 1990s with donors' investments in roads. For example, 86% of the route from Mombasa to Kampala is fully functioning,[43] but delays at border crossings remain time-consuming due to administrative hurdles such as customs and tax procedures, clearance requirements, and cargo inspections. Rallaband and Macchi (2008) find that truckers spend on average more than one day at the border-crossing between Kenya and Uganda. The main source of delays appears to be less the availability and the quality of the road infrastructure than administrative procedures.

Regulation problems go beyond administrative processes, however, to cover market regulation and competition. The lack of competition in the transport sector is a source of high transport costs. According to Rallaband *et al.* (2008), it is important to differentiate between transport costs (cost to transport service providers) and transport prices (costs to traders). They show that transport costs are not overly high in Africa but transport prices are. This is mainly due to official and unofficial market regulations and the market structure of the trucking industry. As shown in Figure 10, the route from Mombasa to Kampala has the lowest price and the lowest cost per kilometer among the ten African road corridors they analyze. The trucking environment and market structure in Central and West Africa are characterized by cartels offering low transport quality, while in East Africa the trucking environment is more competitive and more mature. Indeed, most of all African regions have freight sharing agreements between countries but East Africa has no such bilateral agreements with quotas making this region more competitive.

Another aspect of the time cost is the uncertainty that delays create for trade. Unpredictability discourages trade and may lead to the loss of lucrative business. When unpredictable delays due to transit and roadblocks occur along the way, trucks often arrive at the port after the departure of the ship that was meant to carry the goods. It is important to note that Uganda's NTEs are in majority time sensitive and perishable agricultural products making time and the conditions of delivery especially critical. This may explain why there was no alternative to air transport for the flower industry (Section 4).

Finally to illustrate the importance of infrastructure in transit counties in reducing transport costs (Section 4), the improved trade performance of Uganda is in part due to an easier access to port facilities and better port efficiency in Kenya. The recent *Global Competitiveness Report 2010-2011* (World Economic Forum, 2010) assesses the ease of access to port facilities for Uganda and the quality of ports for Kenya, and found that the score has improved substantially since 2003 for both countries (Figure 11). This is mainly due to the establishment of the EAC and the improvement of trade facilities in the port of Mombasa, which has undertaken maintenance operations, system upgrades, and streamlining port procedures. As a result, port congestion, inefficiency and processing

times have been significantly reduced, thereby decreasing the level of uncertainty. According to the World Bank (2011), waiting time at the port of Mombasa has been reduced since 2006 from 19 to 13 days.

Figure 10. International Transport Prices and Costs along Africa's Road Corridors

From gateway to destination
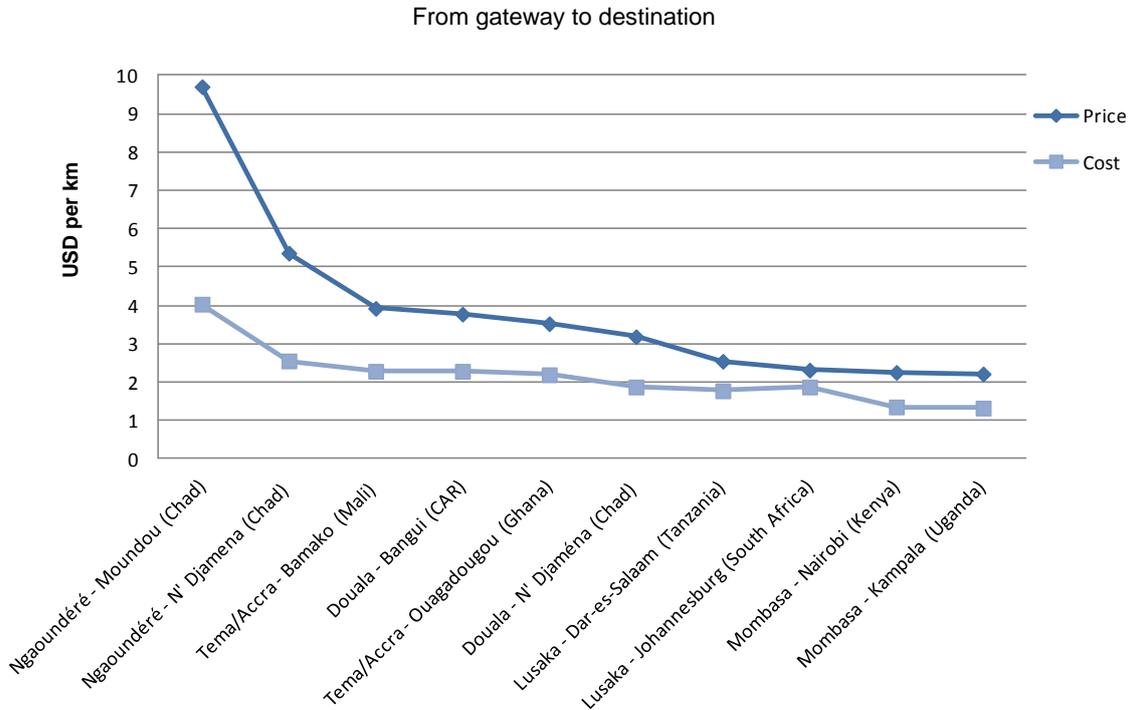
Cost is the sum of the fixed and variable costs.
Source: Raballand and Macchi (2008).

Firms recognize that these efforts that led to the improvement of transportation in Uganda. The *Enterprise Surveys* reports that the percentage of exporting firms in Uganda that mention transportation as a major constraint decreased from 36.1% in 2003 to 23.7% in 2006.

The present study is based on the issues related to the most binding constraints to trade expansion. As demonstrated in Milner *et al.* (2000), customs tariffs were not the major barriers to trade in Uganda and their reduction was not enough to boost export growth in the 1990s. Moreover, the increase in tariffs under the EAC customs union did not stop the trade expansion.

The most binding constraints to trade were mainly related to transportation, in particular, the time spent at border crossings and the uncertainty arising from unpredictable transport time. Regional integration (EAC) helped lower transport costs and stimulate trade relations with the member countries in its vicinity. Time costs were also lowered as a result of improved customs procedures and better access to ports reduced the time and uncertainty associated with exports and imports. The fact that perishable NTEs such as flowers, fruits, and vegetables were air-shipped also played a pivotal role in alleviating transport costs. This provides support to the econometric work's finding on constraints to landlocked countries trade (Section 4), notably the importance of reducing time to trade.

Figure 11. Access to and Quality of Port Infrastructure
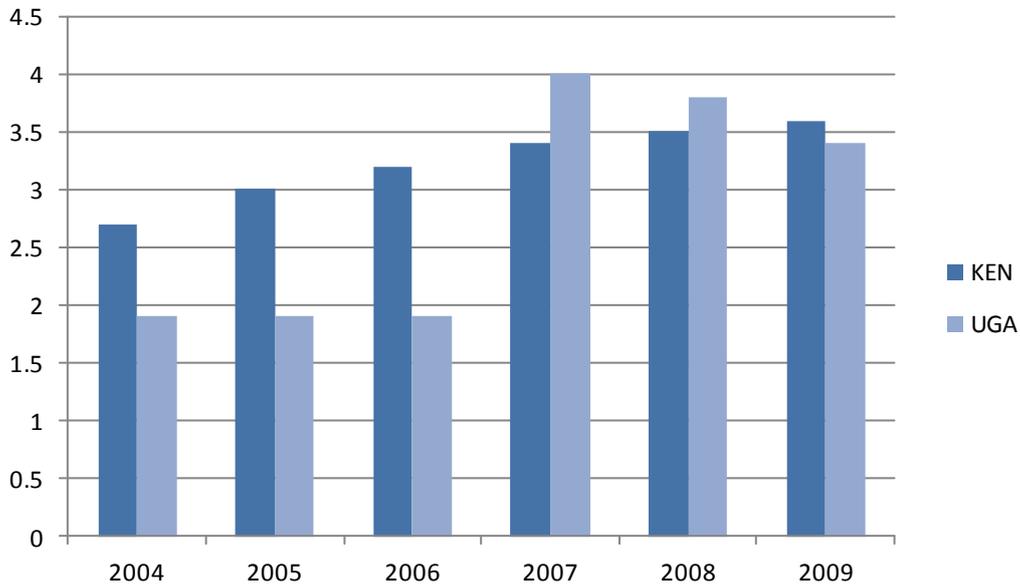
The index for Uganda reflects the ease of access to the port while the index for Kenya captures quality of the port infrastructure. The assessment of port facilities goes from 1= extremely underdeveloped to 7= well-developed.

Source: World Economic Forum (various years).

The conclusion to be drawn is that it is important for Uganda to maintain the momentum and continue to sustain both product and market diversification, and to improve its trading environment. According to the OECD's Creditor Reporting System (CRS) aid activity database, donors are responding to the needs of Uganda. Total aid-for-trade disbursements have considerably increased over the period 2005-2008, with 52% of total aid-for-trade flows going to infrastructure and 46% to building productive capacity. In 2008, some important aid-for-trade commitments were decided, largely in transport infrastructure. The road transport received USD 93.9 million, some 30% of total donor commitments, demonstrating strong support to the country's transport constraints.[44]

7.   Results for commodity exporters

In this report, commodity exporters are defined as countries for which raw materials (definition in Appendix 2) account for more than 45% of goods exported. According to this criterion, 74 countries are commodity exporters (76 if Afghanistan and Iraq are taken into account). For 19 countries, data were available to run the core regressions presented in Table 7. The sample is not limited to oil or mineral exporters, but includes countries whose exports are mainly agricultural products. Not surprisingly, 40% of the country sample is also SVEs.

Table 7. Results for Commodity Exporters

	Openness	Exports	Imports
loggdp1	-0.128***	-0.116***	-0.143***
	(0.0196)	(0.0289)	(0.0243)
l_road_paved	-0.044	-0.141***	0.018
	(0.0263)	(0.0375)	(0.0319)
l_electric_cons_percap	0.163***	0.400***	0.025
	(0.0215)	(0.0275)	(0.0240)
l_dom_credit	-0.085**	-0.355***	0.0431
	(0.0391)	(0.0711)	(0.0400)
Simple_average3_mfn	-0.025***	-0.023***	-0.023***
	(0.00422)	(0.00623)	(0.00476)
l_gfcf1	0.279***	0.108	0.464***
	(0.0631)	(0.0990)	(0.0753)
l_reer	-0.656***	-0.864***	-0.460***
	(0.162)	(0.297)	(0.170)
l_government_spending	0.002	0.355***	-0.243**
	(0.101)	(0.123)	(0.118)
l_herfindahl	0.590***	1.203***	-0.004
	(0.0843)	(0.0979)	(0.0906)
Constant	-8.693***	-9.204***	-10.14***
	(0.684)	(1.339)	(0.705)
Observations	99	100	100
R-squared	0.830	0.843	0.787
Trade variable in growth estimate	0.011	0.011	0.020
	(0.102)	(0.077)	(0.148)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Core results for the unrestricted sample (Table 1) suggest that commodity exporters are less open than other developing countries because of a statistically significant (at the 99% confidence level) smaller ratio imports-to-GDP. For export the coefficient is close to zero and positive. These specificities provide a rationale for looking at the specific constraints to trade in this type of countries. They are recognized by the international community. Paragraph 55 of the Hong Kong Ministerial Declaration states: "We recognize the dependence of several developing and least-developed countries on the export of commodities and the problems they face because of the adverse impact of the long-term decline and sharp fluctuation in the prices of these commodities" (WTO, 2005a).

The *Enterprise Surveys* suggest that the main constraints faced by exporters are broadly similar than those expressed for all developing countries both in their ranking and in their magnitude (Figures 3 and 12). As for other groups, electricity is the main complaint from both exporters and non-exporters (Appendix 8) with 46% of exporters mentioning it as a constraint. Access to finance comes third in the list of constraints mentioned by exporters, but second for non exporters. This explains why, for all firms, access to credit comes second (before the tax rates) on the list of constraints to business. Transportation, which is never mentioned in any country as the main constraint, is reported as a constraint for 27.5% of the exporters surveyed.

Figure 12. Surveys of business constraints faced by commodity exporters
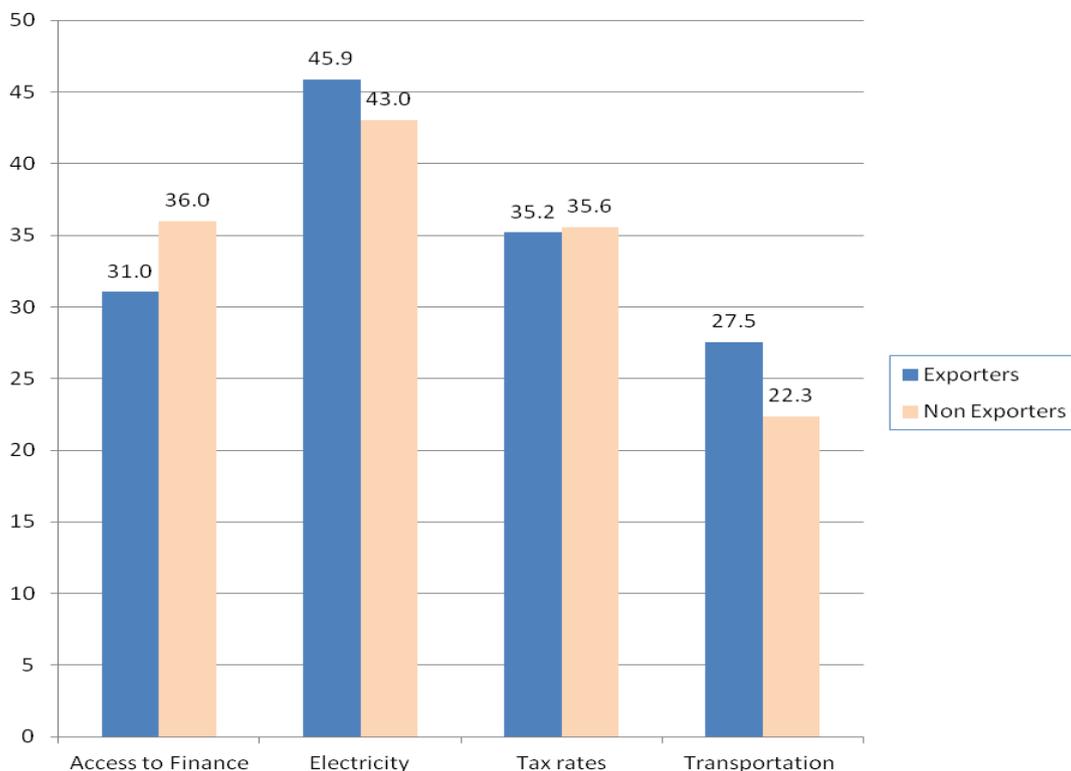
Source: Author's calculations based on World Bank (2010).

As expected core results show that commodity exporters have a strong export concentration (Table 7). This basically confirms the specificities of resource-rich countries. While export concentration was expected to have a negative sign for SVEs reflecting the impact of their small size and limited productive base, it is expected to be positive for commodity exporters. Indeed commodity production, notably extractive activities, are often meant to be exported resulting in larger openness ratios. This impact is large and not offset by the fact that through various mechanisms, including the Dutch disease,[45] a sharp increase in exports of commodity tends to discourage the development of other tradable goods. Our results report that for commodity exporters the estimated coefficient for export concentration is positive, large, and significant (at the 99% confidence level) for exports but, as expected, close to zero and statistically not significant for imports. This result is robust to all alternative specifications (Appendix 7). This variable is, therefore, more a control variable and than a policy variable in the sense that export diversification would reduce the dependence to a few number of products.[46]

Figure 13. The Curse of Natural Resources (1970-1989)
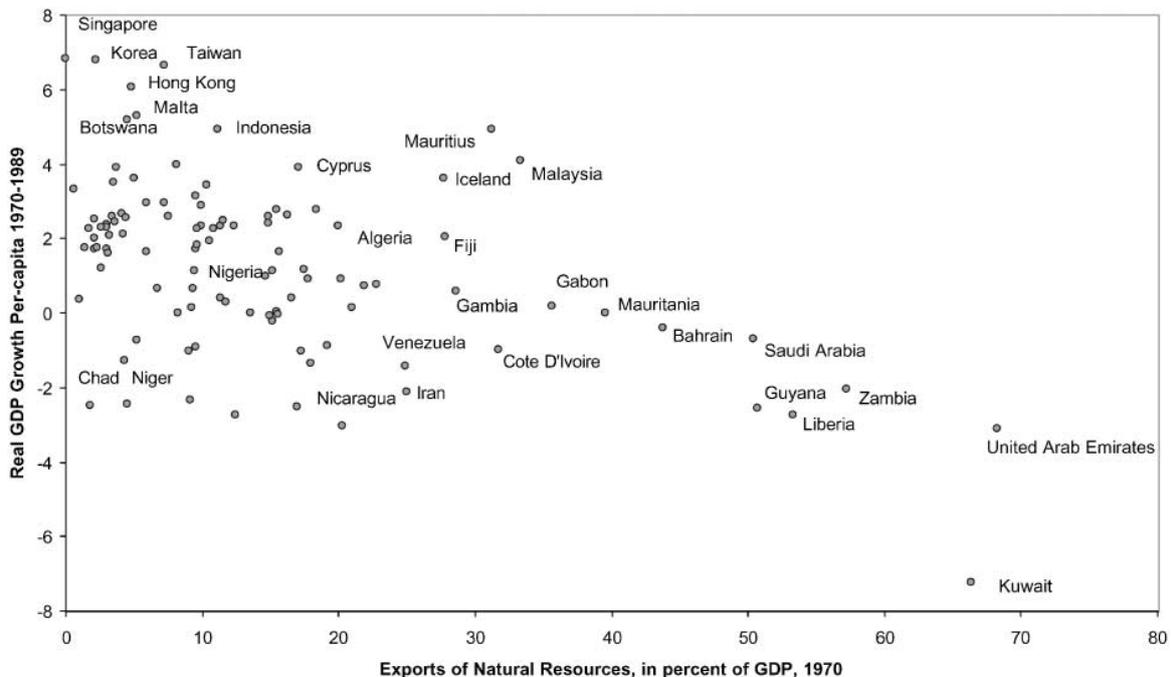
Source: Sachs and Warner (2001).

As for all other country groupings, trade is a source of economic growth both through the impact of exports and imports. The impact of trade on economic growth appears to be however smaller in magnitude than for other country groupings. In core results as well as in alternative specifications (Table 7 and Appendix 7), a 10% increase of the openness ratio is associated with an increase in the economic growth rate limited to 0.09% to 0.17%. The relatively low impact of trade on commodity exporters' economic growth is in line with the literature. In influential papers, Sachs and Warner (1995, 2001) have documented with a cross-section analysis the so-called "natural resources curse," that is countries with great natural resource wealth tend to grow more slowly (Figure 13). More recently, Collier and Goderis (2007) used a co-integration method to investigate the short- and the long-term impact of volatility of commodity prices on economic growth and

income.[47] Focusing on the period 1970-2004, they documented that the natural resources curse was confined to non-agricultural commodities. In particular they found that an increase in commodity prices adds considerably to the economic growth rate in the short term but that this impact is not sustained. After two decades, the typical non-agricultural commodity exporter is producing less than it would have done in the absence of an increase in commodity price. In short, one problem of commodity exporters is that their high export concentration makes them more vulnerable to world commodity prices. This volatility affects economic growth negatively and changes the terms of trade (with a possible Dutch disease effect, see below) which in turn tend to reinforce export concentration. Indeed, Rodrik (1998) has shown that the terms of trade and export concentration are highly correlated.

7.1 The trade regime: a significant constraint to both export and import performance

The tariff regime for commodity exporters is a more severe constraint than for other country groupings. In the core result, as well as in all alternative specifications presented in Appendix 7, the impact of the MFN import tariff is significant at the 99% confidence level (Table 7). As for other country groupings, results point to the fact that import tariffs are detrimental not only to imports but also to exports. Actually, their impact is more detrimental to exports than imports. A 10% cut in tariffs would increase the export-to-GDP ratio by 0.2-0.6 percentage point and the import-to-GDP ratio by 0.2-0.3 percentage point. This impact is limited but much larger than for any other country grouping.

Using applied tariff, although based on a smaller sample, shows that this result is robust not only to alternative specifications but to other measures of tariffs. All coefficients remain significant at the 99% confidence level and a 10% cut in tariff would increase the export-to-GDP ratio by 0.4 percentage point and the import-to-GDP ratio by 0.5 percentage point (Table A7.1).

7.2 Infrastructure problems are limited to electricity and constrain only exports

Infrastructure problems appear to be less severe than in other country groupings. As expected from the results of the *Enterprise Surveys*, electricity appears to be a major constraint to trade performance but, only for exporters.

Electricity problems are due to availability rather than to reliability. This contrasts with the finding for the unrestricted sample and SVEs, but is similar with the results for landlocked countries. A 10% increase in electricity consumption is associated with an increase of 4 percentage points of the export-to-GDP ratio and of 1.6 percentage points of the openness ratio. This impact is significant at the 99% confidence level. The impact on imports is 16 times smaller and not statistically significant (Table 7). In contrast, with a smaller sample (15 instead of 19 countries), reliability has a much smaller impact that is never statistically significant (Table A7.2).

When telecommunication variables are added to the core results they are statistically insignificant. However, the telecommunication infrastructure has a significant impact on economic growth, but this impact is direct and not through trade. For example, a 10% increase in telecommunication equipment is expected to increase the growth rate by over 0.4%, with the impact through trade, although positive, negligible at 0.02% (Table A7.3). The estimate is similar if only fixed lines are considered. It is noteworthy that when

telecommunication infrastructure is added to the specification, the results of all coefficients prove remarkably robust but the estimated impact of trade on economic growth increases significantly: it is three to four times larger than in Table 7, which confirms shows that the impact of telecommunication on economic growth is direct and not through trade.

Transport infrastructure does not appear to be a constraint to commodity exporters' trade performance: both the impact of the quality of road and the quantity of road are usually not statistically significant and are not robust to alternative specifications. The case story of Azerbaijan (Section 8) provides additional insight on the importance of infrastructure in a commodity exporter.

7.3 The importance of complementary policies: Promoting investment and improving governance

Poor governance and the Dutch disease are often put forward as an explanation of the natural resource curse. Collier and Goderis (2007) argue that excess public and private consumption are, along with insufficient investment, the mechanism through which poor governance dissipates the opportunities provided by natural resource revenue. Similarly, Page (2008) argues that "government, through improvement in the investment climate and public expenditures, can mitigate the worst consequence of the Dutch disease." He also argues that successful diversification away from dependence on natural resources was the result of public policies that mitigated the impact of the Dutch disease. In this context, our econometric work provides an interesting perspective.

All policies that seek to boost investment will have a positive impact on trade openness and is crucial for development. Indeed, investment is central to long term growth and to development in all countries, but is particularly important for resource-rich countries as extraction depletes assets and investment is needed to maintain increased consumption that revenue from natural resource triggered. Moreover, investment that reduces the cost of producing and of trading will help mitigate the impact of the Dutch disease.

The picture that emerges from econometric results is similar to the unrestricted sample but contrasts with the results for landlocked countries and SVEs. While an increase in investment has a statistically significant impact on both exports and imports for landlocked and SVEs, in the case of commodity exporters the impact is only significant (and highly so) for imports. A 10% increase in investment-to-GDP ratio is associated with an increase of 5 to 6% of the imports-to-GDP ratio. The magnitude of the impact is similar to the one in the unrestricted sample. However, while for the unrestricted sample, the impact on exports is limited (1% to 3%) and not statistically significant it is larger (up to 5%) and statistically significant for landlocked countries and SVEs.

The reason for this finding may be the specificities of the investment in commodity countries but also to the impact of a Dutch disease. The impact of an overvalued real effective exchange rate is large and significant at the 99% confidence level. A 10% appreciation of the real effective exchange rate is associated with a drop of the openness ratio of almost 7% due to a drop in exports of almost 9%. This strong impact is to be compared with the smaller impact in magnitude of the real effective exchange rate (and statistically insignificant for exports) for the unrestricted sample and to statistically insignificant results for SVEs. However, the impact of the exchange rate on exports is in

the upper band of the estimates for the landlocked countries (6% to 9% according to Tables 2 and 3). Caution is needed in the comparison because the impact of the real appreciation of the currency, if driven by resource projects (either their large external financing or export receipts), is likely to be more severe for the non-extractive exports. It is beyond the scope of this paper to discuss how to prevent a Dutch disease but it is worth mentioning that Aid for Trade has the potential to help (Hallaert, 2010).

An important component of investment may be public investment aiming at mitigating the impact of the Dutch disease: by reducing the cost of producing and of trading, such investment would offset the impact of the real effective exchange rate appreciation. Our findings may be interpreted as supporting this line of thought as fiscal spending has, for commodity exporters, the usual negative and significant impact on imports, but its impact on exports is generally positive and significant. The result could also be interpreted as a sign of reverse causality: resources from exports of commodities boost the export-to-GDP ratio and provide government with resources to spend. This interpretation is consistent with the fact that resource-rich countries have usually a higher level of public spending than other countries. More work is needed to investigate which interpretation is correct. In particular, this needs to be related to governance issue as government spending will improve trade performance only if it reflects productive investment rather than patronage.

Property rights are our usual measure of the way governance affects trade performance and of the business environment that is crucial for investment. This variable, when added to the core results (not shown), is statistically significant and negative for imports and openness but positive and insignificant for exports. This finding contrasts with the estimate for the unrestricted sample where property rights are always positive for all dependent trade variables, with an impact which is larger on exports. A 10% increase in the property rights variable is associated with an *increase* of 2.3%-2.5% of GDP of the openness ratio for the unrestricted sample but with a *reduction* of 1.2% of GDP in the commodity exporter group. The impact of such an improvement of property rights on economic growth rate is -0.19% for commodity exporters. This *a priori* counterintuitive result is similar to the one of Collier and Hoeffler (2009) and Asiedu and Lien (2011). Collier and Hoeffler (2009) find that democracy (another measure of governance) worsens economic performance in resource-rich countries. They explain this result by the fact that, with large resource revenue, governments do not need to tax and so avoid provoking their citizens into scrutiny. This explanation, although plausible, is at odds with the fact that exporters and non-exporters mention in the same proportion than in other country groupings tax rates as a constraint to their activity (Figures 3-5 and 12). However, findings related to government spending confirm this interpretation. Asiedu and Lien (2011) find that democracy facilitates FDI in countries where the share of natural resources in total exports is low, but has a negative effect on FDI in countries where exports are dominated by natural resources.

Thus, our findings support the literature explaining the natural resource curse. The literature initially emphasized the economic impact of the Dutch disease and more recently focused on the political economy of resource rents (Collier and Hoeffler, 2009 and literature therein). Our results point to the fact that both the impact of overvaluation of the real effective exchange rate and governance play a central role in explaining trade performance of commodity exporters and through trade their economic growth.

Turning to other policies that may promote investment and improve trade performance, it appears that the productivity per worker has a large and highly significant

impact on economic growth (a 10% increase in labor productivity is expected to raise the economic growth rate by 1.2-1.3%) and that this impact is direct while the impact through trade is statistically insignificant. Estimates for access to credit have the wrong sign, which may be due to the fact that many export oriented extractive projects are externally financed. As a result, the econometric result is not necessarily contradictory with the fact that exporters mention access to credit as a constraint to their business (Figure 12): the problem of access to credit may be severe for non commodity exporters, but does not appear in the econometric result if exports are dominated by commodity exporters that are externally financed.

8.   Case study — Azerbaijan: A landlocked commodity exporter

The case study on Azerbaijan illustrates how some variables highlighted in econometric work (e.g. export concentration, Dutch disease, governance) affect the trade performance and the development prospects of commodity exporters. This case study is also provides another illustration of how results on cross-country analysis captured by the econometric work can differ across countries within a group.

Azerbaijan is a commodity exporter of oil. It is also a landlocked country; although it borders the Caspian Sea, the Caspian Sea does not connect to the ocean by natural waterways.[48]Azerbaijan reports that trade is an integral part of its national development plan (OECD/WTO, 2009). It envisages moving toward a diversified and globally integrated market economy (World Bank, 2009). Ensuring sustainable economic development by maintaining macroeconomic stability and the balanced development of the non-oil sector is a strategic goal for the State Program on Poverty Reduction and Sustainable Development (SPPRSD) for 2008-2015.[49] In the survey conducted for the "Aid for Trade at a Glance 2009 – Maintaining Momentum" (OECD/WTO, 2009), the country identified three major binding constraints:

- trade policy analysis, negotiation and implementation;
- network infrastructure; and
- export diversification.

This case study focuses on these binding constraints.

8.1   *Export diversification: a necessity for sustainable development*

Azerbaijan was one of the fastest growing countries in the world during the period 2005-2007 (Figure 14) with an average growth rate of 28.6% following massive foreign direct investment in 2003-2004 (Figure 15). Its strong economic performance was driven almost entirely by its natural resources sector, with the oil and gas industry attracting the vast majority of foreign direct investment inflows and the engine of trade expansion and economic growth.

Figure 14. Azerbaijan – Economic Growth (1998-2009)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
■ %	10	7.4	11.1	9.9	10.6	11.2	10.2	26.4	34.5	25	10.8	9.3
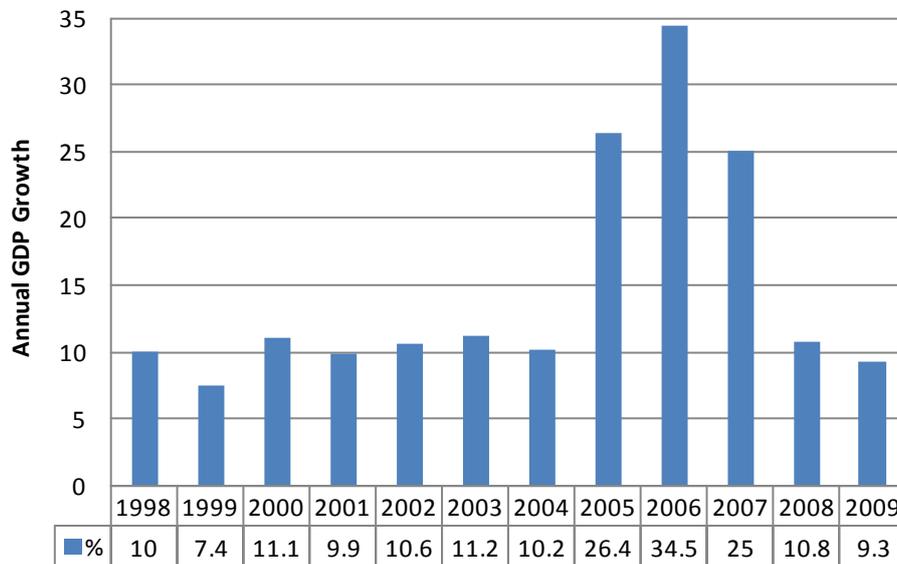
Source: World Development Indicators.

As a result, Azerbaijan's export structure is highly concentrated. In 2008, oil exports represented about 95% of the value of the country's total exports (World Bank, 2009). As illustrated in Figure 16, Azerbaijan experienced a 38% increase in export concentration from 2006 to 2007.

This concentration exposes the economy to the volatility of oil prices and makes it vulnerable to global commodity market developments and to a Dutch disease. Export concentration is a source of instability in export earnings and the recent drop of oil prices illustrates the vulnerability in Azerbaijan: the country saw its growth rate decelerate sharply from 34.5% in 2006 to a single-digit growth rate of 9% in 2009 (Figure 14). In this context, it is important to note that Aid for Trade can help the country move up the value chain in selected sectors as diversifying exports is part of the aid-for-trade mandate and one of the core objectives of the Aid for Trade Initiative (Hallaert and Munro, 2009).

Achieving economic and export diversification is a priority for two additional reasons. First, the oil and gas industry does not create enough jobs. It is a capital-intensive that employs skilled labor, mainly engineering professionals and technicians. While the sector accounts for 60% of GDP, it employs only l.1% of the total workforce (World Bank, 2009). The development of the non-oil economy is thus crucial for employment generation.

Figure 15. Azerbaijan – FDI Inflows (1998-2009)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
US$	948	355	129.93	226.51	1392.4	3285	3556.1	1679.9	-584	-4749	14.09	473.31
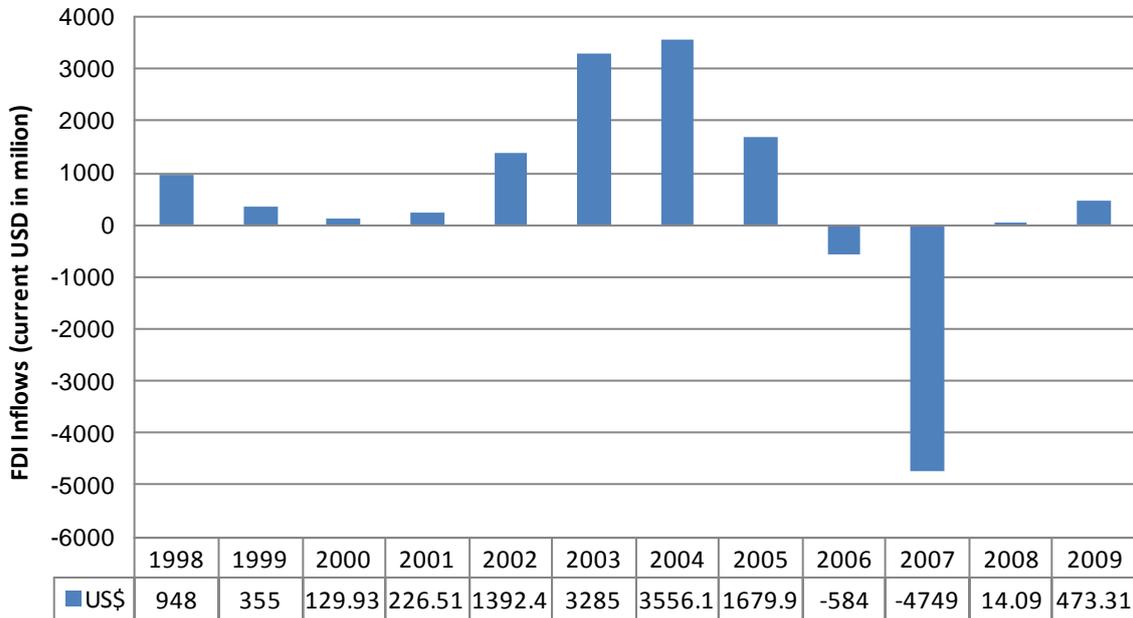
Source: UNCTADstat database (unctadstat.unctad.org/ReportFolders/reportFolders.aspx).

Figure 16. Azerbaijan – Export Concentration (Herfindhal index,1996-2008)
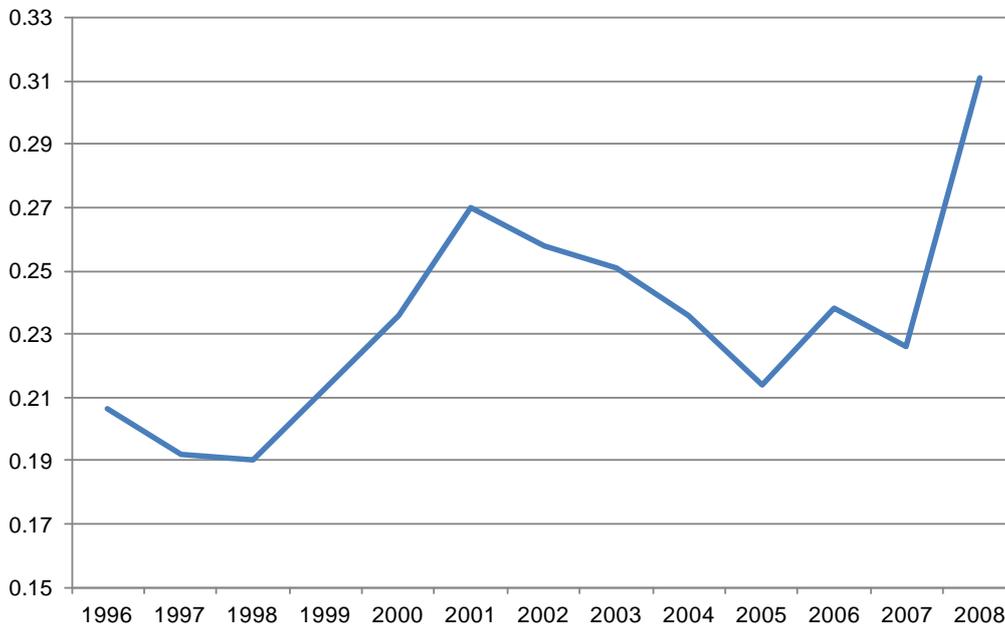
The Herfindhal index is calculated at the HS-4-digit level

Source: Authors' calculation based on COMTRADE database.

Second, although the oil sector is and will remain a large source of export receipts, it cannot provide all resources needed to pay for the imports of an eventual upper-middle income economy. Indeed, oil reserves are expected to be depleted in about 25 to 25 years.

The World Bank (2009) estimates that, in order to achieve its development objectives, Azerbaijan needs to increase its non-oil exports per capita by 50 times in ten years.

8.2   *Ways to achieve export diversification*

Diversifying sources of exports is thus a priority for the economy. This cannot be achieved without boosting trade and FDI in the non-oil sector. This, in turn, requires an enabling business and investment environment across the board. Azerbaijan ranked 54th out of 183 countries in the *Doing Business 2011*. This is an improvement in the overall business environment compared to a ranking of 97th out of 158 countries in the *Doing Business 2008*. However, much progress needs to be made and three main challenges need to be tackled to promote investment in the non-oil sector.

First, taxation is identified as a major problem for doing business by 39% of the exporting firms surveyed (Table 8). The tax level and complexity of the tax system discourage non-oil private investment. According to the World Bank (2009), lower taxation would allow to offset the burden posed by the real exchange rate appreciation in the tradable sector and thus promote investment.

Table 8. Azerbaijan – main constraints to business activities

Major constraints for Doing Business 2009	
Enterprise Surveys (% of exporting firms surveyed)	
Access to financing	49.1
Tax rates	38.89
Ranking in the 2011 Doing Business Report (out of 183)	
Tax level and complexity of the tax system	103
Trading across borders (cost, time, procedures)	177
Protecting investors	20
Global Competitiveness Report 2010-2011 (out of 139)	
Higher education and training	77
Goods market efficiency	93
Financial market development	71

Sources: World Bank *Enterprise Surveys* 2009 and *Doing Business* 2011, *Global Competitiveness Report* 2010-2011.

Second, and consistent with the results of the econometric work for commodity exporters, the absence of competition and the presence of corruption are major impediments to investors and cross-border trade. While the government can play a prominent role in diversification, it should also encourage competition and progress in areas of governance. According to the World Economic Forum (2010), corruption is the greatest problem for doing business in Azerbaijan. For example, it ranked 90 out of 139 countries in the area of property rights, an important sector for export performance and diversification. Azerbaijan ranked 134 out of 178 countries in the 2010 Transparency International Corruption Perception Index. [50]

Third, improving the financial sector is critical for enhancing the competitiveness of Azerbaijan. While econometric results for commodity exporters showed that access to credit has an ambiguous impact on trade, the difficulty of accessing credit is a regional constraint highlighted during the recent Ministerial meeting "Aid for Trade Roadmap for

Central Asian" countries held in Baku in December 2010. In Azerbaijan, according to the *Enterprise Surveys,* 49% of exporting firms perceive access to finance as a major business constraint. The World Economic Forum (2010) also indicated that access to finance was the second most problematic factor for doing business after corruption. It is a particularly severe obstacle for the development of small and medium enterprises (SMEs).

Azerbaijan's financial system is not yet integrated into the world economy and does not provide a diverse range of financial products to businesses. As a result, in contrast to its neighbor Kazakhstan, the recent global financial crisis did not trigger major problems in the sector. The global crisis also led to a sharp increase in real interest rate. Inflation had surpassed 20% in 2008 due to soaring demand and high food prices, but it fell dramatically in 2009 (Figure 17). As a result of this rapid disinflation, real interest rates became very high despite the cut in the refinancing rate, which did not trigger a drop in lending rates. Access to credit thus became subsequently more difficult, and limited access to finance reduces opportunities for SMEs to grow and diversify into other economic activities.

It is noteworthy that aid-for-trade support to the financial and banking sector increases dramatically in relative terms. While support to the banking and financial sector accounted for only 18% of aid-for-trade flows disbursed during the period 2005-2008, the share in 2008 commitments jumped to 39% (Table 9).

Table 9. Azerbaijan – Aid-for-Trade flows

Constant 2008 USD

	Disbursements 2005-08	Commitments 2008
Transport and Storage	15%	19%
Telecommunication	2%	1%
Energy	18%	13%
Banking and Finance	18%	39%
Business and Other Services	7%	14%
Agriculture, Forestry, Fishing	21%	10%
Industry	15%	1%
Mineral Resources and Mining	0%	0%
Tourism	0%	0%
Trade Policies and Regulations	3%	3%

Source: Authors' calculation based on CRS data.

Given that Azerbaijan's development rests on trade, export diversification, and FDI, the effort to improve the business environment needs to be accompanied by a broad reduction in trade barriers for the non-oil exports. However, the country has accorded only a low priority to trade issues. This is reflected in its low ranking (177th place) in the Doing Business' trading across borders indicator (Table 8). According to the econometric analysis, the tariff regime is a more severe constraint for commodity exporters than other country groupings but the impact of tariff remains small in Azerbaijan as the simple

average MFN applied tariff was not particularly high, reaching 8.7% in 2009.[51] The major impediments are found in high transaction costs resulting from informal barriers and administrative procedures for business operations with respect to licenses, customs clearances, and tax inspections that turn away potential investors. These high transaction costs limit the entry of new firms and have a negative impact on the competitiveness, resulting in higher market concentration in various sub-sectors of the economy.

Trade reforms alone are not sufficient and macroeconomic policies should be compatible with the development of the non-oil sector and preserve the competitiveness of the non-oil sector. In Azerbaijan, the risk of Dutch disease detrimental to competitiveness of the non-oil tradable sector is substantial. Past experience shows that overvalued exchange rate is a key factor in the failure and reversal of reform aiming at opening up the economy to global trade (Hallaert, 2010). Moreover, oil price instability could lead to unpredictable public spending that would also raise real exchange rate and price volatility. Finally, as illustrated in Figure 17, Azerbaijan's real effective exchange rate appreciated by 74% during the period 2004-2009 in part as a result of the increasing non-oil fiscal deficit, inflationary pressures driven by the country's rapid economic growth, inflows of capital, and rising exports receipts.

Experience shows that identifying the potential non-oil export sectors is difficult. According to Brenton and von Uexhull (2009), aid to export promotion is more successful at helping existing exports than at creating new ones. Azerbaijan's agricultural and agri-business sectors may hold significant potential, given its existing knowledge and export base, and its climatic and geographic advantages (World Bank, 2009). These sectors have received the largest amount of aid-for-trade flows (21% of total AFT) since 2005. However, despite its importance, commitments in 2008 are, in relative terms, much smaller at 10%.

Diversification brings a lot of benefits but, as pointed out by Massell (1970), export diversification depends on "fundamental matters," such as comparative advantage and policies. Therefore it is more useful to improve the business environment across the board rather than provide advantages to a limited number of industries. In this context, Pomfret (2010) highlights the importance of improving soft and hard infrastructure and the need to retain flexibility to ameliorate any mode of transport to any market. Promoting an efficient regional network and implementing regional integration agreements are primordial to reach its full trade potential.

So far, infrastructure problems do not appear to be a significant constraint to trade. Although Azerbaijan identified network infrastructure as priority for Aid for Trade (OECD/WTO, 2009), the *Enterprise Surveys* report that only 13.4% of exporters and 12.0% of non-exporters mention electricity as a problem for their activities. Similarly, consistent with the econometric findings for both landlocked countries and commodity exporters, no exporter mentions transportation as a constraint and only 3.7% of non-exporters do so. This may reflect the fact pipelines are the primary means of transport since oil represents virtually all exports. In addition, investments in roads and railways have been made in order to reduce the cost of transportation along the country's main corridors (North-South: Russia-Iran and East-West: Baku-Georgia). These corridors are important to achieve another element of Azerbaijan's diversification strategy: promote regional trade and diversify the country's exports market, which are currently limited to the European Union, Russia, and Turkey.

This case study shows that Azerbaijan is endowed with natural resources but that expanding its non-oil exports remains a challenge. Economic diversification and

increased competitiveness could help achieve its objective to become an upper middle income economy in ten years but the needs are numerous and cannot be tackled all at once. It is therefore necessary to prioritize and sequence correctly the reforms. The combination of trade reforms and macroeconomic stability will allow the country to attain better trade performance. Complementary policies in areas of governance, access to finance, and tax regulations as well as regional network are also important to increase its full potential. According to responses to the partner questionnaire on Aid for Trade (prepared for the joint OECD – WTO *Aid for Trade at a Glance 2011 – Showing Results*, *forthcoming*), Azerbaijan responded that Generalized System of Preferences trainings had a positive impact on export diversification and the suppression of documents required for export of import under Presidential decree No. 260 of 14 May 2010 within the framework of WTO accession illustrated the importance of complementary policies. Aid-for-trade priorities in Azerbaijan have not changed since 2008 and the country estimates that donors have made progress in aligning aid-for-trade support with the country's national priorities.

Figure 17. Azerbaijan – Inflation and Real Effective Exchange Rate (1998-2009)
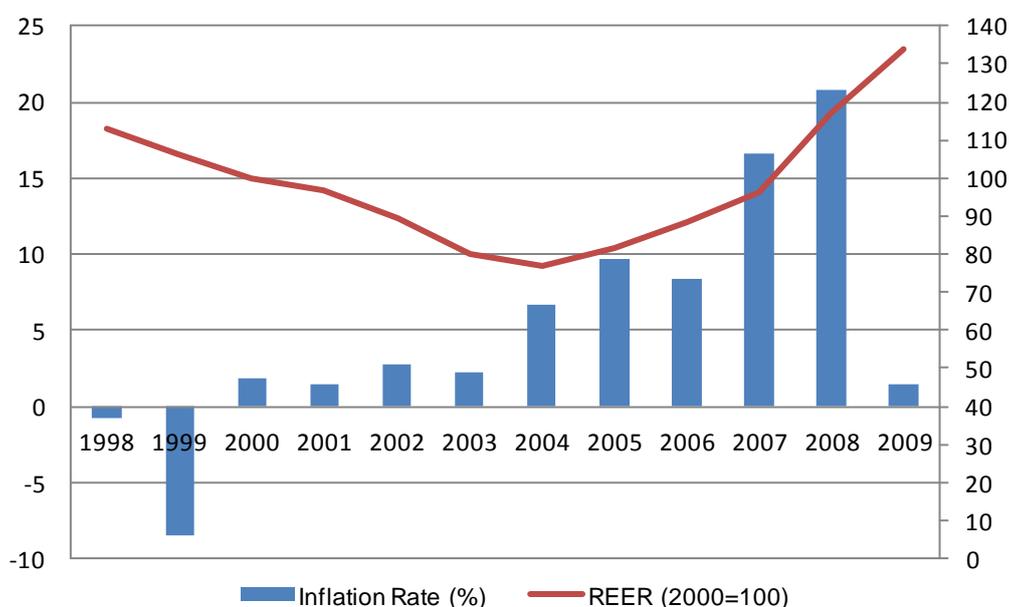
Source: IMF and ISA (2011).

9.   Conclusion

This report provides quantitative evidence on the severity of the constraints to countries' trade performance. It supports the main conclusion from two initial reports on the issue *Binding Constraints to Trade Expansion: Aid for Trade Objectives and Diagnostics Tools* (Hallaert and Munro, 2009) and *Increasing the Impact of Trade Expansion on Growth: Lessons from Trade Reforms for the Design of Aid for Trade* (Hallaert, 2010). That is, it is important to identify the most binding constraints to countries' trade performance in order to: (i) prioritize and sequence reforms; and (ii) for donors to align aid based country specific needs.

The main conclusions are the following. First, both imports and exports boost economic growth, but the constraints to exports differ from those applicable to imports.

This finding has many policy implications, the most important being that trade reform should focus not only on export promotion but also on the role of imports. Moreover, it confirms the fact that in promoting trade expansion, Aid for Trade contributes to economic growth in developing countries.

Second, the report confirms a large body of literature suggesting that trade performance depends much less on customs tariff reforms than on a large variety of supply-side constraints, such as electricity or access to credit. The severity of electricity problems in many countries is well recognized but this report shows that it dramatically affects trade performance and economic growth (directly and through trade) of many countries. The impact we estimate is so large, and shared by all countries, that electricity often appears as a major binding constraint to trade expansion.

Third, compatible and complementary policies are also very important. There are a large number of such policies and only a few could be tested. The macroeconomic environment has a big impact on trade performance, especially the management of the real effective exchange rate. Moreover, reforms which improve access to credit and governance, as well as policies fostering investment and labor productivity are important but their relative importance varies across countries. The importance of complementary policies appears particularly important in the case of transport infrastructure in landlocked countries.

The importance of compatible and complementary policies vindicates the large scope of the aid-for-trade agenda: if trade is to be used as an engine for economic growth, poverty reduction, and development it must tackle many issues. This requires, as mentioned, recognizing the specific trade-related needs of countries but also the adequate sequencing of reforms, and of donor co-ordination.

Fourth, the binding constraints to trade expansion vary significantly across different country groupings. Indeed the severity of the various constraints to trade are different for landlocked countries, small and vulnerable economies, and commodity exporters. As a result the nature and the sequencing of trade reforms and of aid-for-trade should differ across countries.

As with all statistical analysis, our results are likely to be qualified and improved upon by other researchers. In particular, there is a need to capture some important variables for which data are not available such as customs efficiency, sea port infrastructure, or time to trade. It is also important to examine some specific sectors more closely. To this effect, the OECD will analyze the binding constraints to agriculture trade expansion as part of its Programme of Work and Budget 2011-2012. Agriculture is an important sector as it received 19% of Aid for Trade disbursed over the period 2006-2009 and its share is increasing fast (it increased by 20% in 2009 alone) in response to the food crisis.

Notes

1. This report was prepared by Jean-Jacques Hallaert, Ricardo Cavazos Cepeda, and Gimin Kang. Arthur Foch (consultant) is the author of the box on electricity. Clarisse Legendre provided excellent research assistance and Michèle Patterson thorough editorial support. The project benefited from funding by the European Union. The report benefited from the comments of Frans Lammersen, William Hynes, Masato Hayashikawa (all DCD), and Michael Plummer (TAD), from DG Trade and DG DEVCO of the European commission, and from participants to the OECD Global Forum on Trade *Globalisation, Comparative Advantage and Trade Policy* (Chengdu, China, October 2010), to the WTO Regional Seminar on trade and Development for Asian Economies (Hanoi, Vietnam, November 2010), to the OECD Expert Workshop on *Aid for Trade Implementation* (Paris, France, March 2011), to the Twentieth Session on Aid for Trade of the WTO Committee on Trade and Development (Geneva, Switzerland, April 2011), and to the Joint Conference Parliamentary Assembly of the Mediterranean (PAM) and the United Nations Trade and Productive Capacity Cluster (Organized by UNECE in cooperation with UNCTAD and PAM) 2nd Operational Meeting of the PAM Panel on External Trade and Investments in the Mediterranean (Geneva, Switzerland, May 2011).

2. The report was declassified at the November 2009 joint meeting of the DAC and the Working Party of the Trade Committee on Aid for Trade and published as *OECD Trade Policy Working Paper 94* (hereafter Hallaert and Munro, 2009).

3. In this report, "trade reform" is defined as encompassing all reforms and measures that affect the tradable sector. This approach is consistent with the recommendations of the Task Force on Aid for Trade (WTO, 2006): "the scope of Aid for Trade should be defined in a way that is […] broad enough to reflect the diverse trade needs identified by countries."

4. The report was declassified at the June 2010 joint meeting of the DAC and the Working Party of the Trade Committee on Aid for Trade and published as *OECD Trade Policy Working Paper 100* (hereafter Hallaert, 2010).

5. As indicated in the Programme of Work and Budget 2011-2012 of the Trade Committee [TAD/TC(2010)1], a fourth report will have a sectoral approach focusing on agriculture.

6. See, among others, Michaely (1977), Balassa (1978, 1982), Nishimizu and Robinson (1984), Nishimizu and Page (1990), and Tybout (1992).

7. Jones and Romer (2010) showed that differences in total factor productivity explain a large part of cross-country differences in per capita income.

8   See Hallaert (2006) for a survey.

9. Krugman (1979) and Helpman and Krugman (1985) argue that foreign competition reduces market power and forces firms down their average cost curve while Roberts and Tybout (1991) and Melitz (2003) emphasize the role of imports in the reallocation of resources from less productive to more productive firms raising

average productivity. Rodrik (1992) and Melitz and Ottaviano (2008) argue that imports stimulate management efforts.

10   For the theoretical basis, see Krugman (1987) Lucas (1988 and 1993), Grossman and Helpman (1991) Young (1991), and Aghion *et al.* (2005).

11   Other studies that consider the effect of imported inputs on productivity (but do not relate the effect to trade liberalization) include Feenstra, Markusen and Zeile (1992) for Korea, Muendler (2004) and Schorr (2004) for Brazil, Halpern *et al.* (2005) for Hungary, and Kashara and Rodrigue (2008) for Chile.

12   Bloom *et al.* (2011) summarize the theoretical literature on import and innovation.

13   The list of the 153 countries and territories is available in Appendix 4 of the report "Aid for Trade at a Glance 2009 – Maintaining Momentum" (OECD/WTO, 2009).

14.   For the sake of brevity, Appendix 2 only describes the variables that are mentioned in the report.

15.   Explained variables are expressed in percent of GDP.

16.   The *Doing Business* database starts in 2004 (see for an overview of the database: data.worldbank.org/data-catalog/doing-business-database).

17.   The number of countries refers to core results. The shares are calculated using flows in constant US dollars and exclude from the total Afghanistan and Iraq. Afghanistan and Iraq are large recipients of Aid for Trade but are excluded because they are outliers that could bias the results. Indeed the rationale of aid provided to these countries is largely affected by the security situation and reconstruction needs they face. If taken into account in the total amount of aid disbursed and committed, the country coverage in this study accounts for 49% of disbursements and 48% of commitments.

18.   The authors tried to identify specific binding constraints to trade of islands but it was impossible to run meaningful regressions because of the small size of the sample and insufficient data.

19.   While it is easy to identify a landlocked country or an island, there is no official definition of small and vulnerable economies or commodity exporters. The definition of these groups is provided in Sections 5 and 7 and the list of countries is provided in Appendix 3.

20.   According to the Lerner symmetry theorem, an ad valorem import tariff will have the same effects as an export tax effect on output decisions and resource allocation (Lerner, 1936). For empirical evidence of the impact of import tariffs on exports, see for example Tokarick (2006) who finds that, on average for a sample of 26 developing countries, import tariffs are equivalent to a 12.5% tax on a country's exports.

21.   This survey covers more than 120 000 firms in 125 countries of which 103 countries are eligible to receive Aid for Trade. Appendix 8 provides descriptive statistics of the constraints mentioned by firms for various country groupings.

22.   To proxy access to credit we use the amount of credit extended by banks and other financial institutions to the private sector as a share of GDP. This variable is broader than trade finance only as it captures the depth of the local domestic system. It is appropriate for the purpose of our analysis as Aid for Trade support to the banking and financial sector includes trade finance but also capacity building and support for

regulatory regime. However, the variable does not capture the non intermediated credit which can be large in some countries and for trade finance (Hallaert, 2009).

23. See Stiebale (2011) for a review of literature and the channels through which financial conditions can affect exports.

24. See also Fafchamps *et al.* (1994), Fafchamps (1997), Nkurunziza (2010) and literature therein.

25. Balat *et al.* (2009) illustrate this point with the case of Uganda.

26. Total factor productivity is, with investment, one of the main avenues through which trade affects growth. As described in the previous section it is one of the main channel through which imports boost economic growth. The variable used in this paper is the labor productivity not total factor productivity in order to capture the impact of complementary policies and limit endogeneity problems.

27. Moreover, the two studies focus on different periods and a different country samples.

28. On trade openness and volatility see di Giovanni and Levchenko (2009).

29. Other fiscal variables have been tested but face the same fragility problem and thus are not shown.

30. To check if the results were not capturing the transition process, a dummy has been tested. Its impact is marginal and most of the time not significant. Therefore, for the sake brevity, it is not reported.

31. See Appendix 5 for the robustness of the various results.

32. OECD/WTO (2009) showcases three road corridors.

33. The World Bank's *Doing Business* database quantifies many relevant problems such as the time needed to trade, customs procedures, time, and cost, as well as shipping cost and time, etc. However, these indicators are only available since 2004, a period too short for the econometric work.

34. The issue was the main topic of session two of the OECD Experts Workshop on Aid for Trade Implementation held in Paris on 28-29 March 2011. The presentations are available at:
www.oecd.org/document/17/0,3746,en_2649_34665_47256401_1_1_1_1,00.html.

35. This contrasts with OECD countries. For example, Hummels (2001) mentions that the share of US trade that is air-shipped increased form virtually zero in 1950 to 30% in 1998.

36. Putting the population threshold at 10 million would exclude three signatories of the Hong Kong Communiqué namely, Cuba, Guatemala, and Sri Lanka. It has thus been decided to increase the threshold to 15 million to cover all signatories but Sri Lanka, whose population is close to 20 million.

37. In Paragraph 35 of the Doha Declaration, WTO member states: "We agree to a work programme, under the auspices of the General Council, to examine issues relating to the trade of small economies. The objective of this work is to frame responses to the trade-related issues identified for the fuller integration of small, vulnerable economies into the multilateral trading system, and not to create a sub-category of WTO Members. The General Council shall review the work programme and make recommendations for action to the Fifth Session of the Ministerial Conference."

38.   This result is robust to alternative transport variables (road as shown in Appendix 6 or air transport, not shown), to alternative tariff rates (applied instead of MFN, not shown), and to the introduction of telecommunication infrastructure. The only exception is the change in electricity variable (Appendix 6).

39.   It is thus important to consider an indicator of volatility. An export concentration index has been preferred over terms of trade because it is amore relevant measure of external risk for Aid for Trade and policy makers (reducing export concentration is an objective of the initiative while terms of trade are not). Moreover, the two indicators tend to be highly correlated (Rodrik, 1998).

40.   The COMESA is a preferential trading area with nineteen member states stretching from Libya to Zimbabwe. COMESA was formed in December 1994 with the aim of achieving economic prosperity through regional integration. See Khandelwal (2004) for a detailed description of COMESA. The EAC is a preferential trading area consisting of Uganda, Kenya, Tanzania, Rwanda, and Burundi and its ultimate objective is to first establish a customs union, a common market, then a monetary union and eventually a political federation.

41.   Uganda Bureau of Statistics and Uganda Export Promotion Board.

42.   Available at: www.doingbusiness.org/.

43.   Rallaband and Macchi (2008) provide evidence that based on trucking survey results of seven African countries transport quality seems to be the highest in Kenya and Uganda.

44   OECD / DAC Creditor Reporting System (CRS). Data available at: www.oecd.org/document/21/0,3746,en_2649_34665_43230357_1_1_1_1,00.html.

45.   "Dutch disease" refers to the harmful consequences of large increases in a country's inflows of foreign currency. The inflow leads to currency appreciation, making the country's other products less price competitive on the export market. It also leads to higher levels of cheap imports and can lead to deindustrialisation. The term is generally associated with increase in exports revenue from natural resource, but it can occur from any large inflow of foreign currency, such as foreign assistance or FDI.

46.   Controlling for the volatility in world commodity prices does not change the conclusion of this section.

47.   Volatility of income in countries exporting exhaustible resource has been historically two to three times higher than in other economies (Bems and de Carvalho Filho, 2011). Hallaert and Munro (2009) survey evidence linking negatively volatility in income to economic growth.

48.   The Caspian is connected to the Black Sea via the Volga and Don rivers and a 60 km canal, which links the two rivers; it is navigable only by seagoing vessels less than 5 000 gross tons.

49.   The SPPRSD is Azerbaijan's Poverty Reduction Strategy Paper.

50.   Available at: www.transparency.org/.

51.   Tariff Analysis Online facility provided by WTO, available at: www.wto.org/english/tratop_e/tariffs_e/tao_help_e.htm .

References

AfDB (African Development Bank) (2007), *Djibouti, document de stratégie par pays axée sur les résultats 2007–2010*, Tunis: African Development Bank / African Development Fund, available at :
www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/ADB-BD-WP-2007-127-FR-DJIBOUTI-DSP-2007-2010.PDF .

Agboghoroma, A., M. Busse, S. Falatik, R. Hoekstra, J. Königer, G. Koopman, C. Kühne, and N. Roloff (2009), *Aid for Trade: making trade effective for development — Case studies from Kenya, Tanzania and Uganda*. Hamburg: PricewaterhouseCoopers and Hamburg Institute of International Economics.

Aghion, P., R. Burgess, S. Redding and F. Zilibotti (2005), "Entry Liberalization and Inequality in Industrial Performance," *Journal of the European Association*, vol. 3(2-3), 291-302.

Amity, M. and J. Konings (2007), "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia," *The American Economic Review*, vol. 97(5), 1611-1638.

Arvis, J.F., G. Raballand, and J.F. Marteau (2007), *The Cost of Being Landlocked: Logistic Costs and Supply Chain Reliability*, Washington, D.C.: World Bank, Policy Research Working Paper 4258.

Asiedu E. and D. Lien (2001) "Democracy, foreign direct investment and natural resources," *Journal of International Economics*, vol. 84(1), 99-111.

Aw, B.W., S. Chung & M. Roberts (2000), "Productivity and turnover in the Export Market: Micro-level Evidence from the Republic of Korea and Taiwan (China)," *The World Bank Economic Review*, vol. 14(1), 65-90.

Balassa, B. (1978), "Exports and Economic Growth: Further Evidence," *Journal of Development Economics* vol. 5(2), 181–189.

Balassa, B. (1982), *Development Strategies in Semi-Industrialized Economies,* Baltimore: John Hopkins University Press.

Balat, J., I. Brambilla, and G. Porto (2009), "Realizing the gains from trade: Export crops, marketing costs, and poverty," *Journal of International Economics*, vol. 78(1), 21-31.

Beck, T., A. Demirguc-Kunt, and R.E. Levine (2010), "A New Database on Financial Development and Structure" (updated April 2010), available at:
econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20696167~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html.

Bems R. and de Carvalho Filho, I. (2011), "The current account and precautionary savings for exporters of exhaustible resources," *Journal of International Economics*, vol. 84(1), 48-64.

Bloom, N., M. Draca, and J. Van Reenen (2011), *Trade-Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity*, Cambridge, MA: NBER, Working Paper 16717.

Bolaky, B. and C. Freund (2008) "Trade, Regulations, and Income," *Journal of Development Economics*, vol. 87(2), 309-321.

Brenton, P. and E. von Uexkull (2009), "Product specific technical assistance for exports − has it been effective?" *The Journal of International Trade & Economic Development*, vol. 18(2), 235-254.

Bulír, A. and A. J. Hamann (2007), "Volatility of Development Aid: An Update," *IMF Staff Papers*, vol. 54(4), 727-739.

Calì, M. and D.W. te Velde (2009), *Aid for Trade in Small and Vulnerable Economies*, Commonwealth Trade Hot Topics 59.

Chang, R., L. Kaltani, and N. Loayza (2009), "Openness can be Good for Growth: The Role of Policy Complementarities," *Journal of Development Economics*, vol. 90(1), 33-49.

Coe, D.T., E. Helpman, and A.W. Hoffmaister (1997), "North-South R&D Spillovers," *The Economic Journal*, vol. 107(440), 134-149.

Collier, P. and B. Goderis (2007), "Prospects for Commodity Exporters: Hunky Dory or Humpty Dumpty?" *World Economics*, vol. 8(2), 1-15.

Collier, P. and A. Hoeffler (2009), "Testing the Neocon Agenda: Democracy in Resource-rich Societies," *European Economic Review*, vol. 53(3), 293-308.

Corrales-Leal, W., F. Baritto, and S. Mohan (2007), *Special and Differential Treatment for Small and Vulnerable Countries Based on the Situational Approach*, Geneva: International Center for Trade and Sustainable Development, Issue Paper 2, available at: ictsd.org/downloads/2009/02/special-and-differential-treatment-for-small-and-vulnerable-countries-based-on-the-situational-approach.pdf

Delpeuch, C., M.A. Jouanjean, A. Le Vernoy, P. Messerlin, and T. Orliac (2010), *Aid for Trade: A Meta-evaluation*, Paris: OECD (version: 24 November 2010), available at: www.oecd.org/dataoecd/14/61/47423967.pdf.

di Giovanni, J. and A. Levchenko (2009), "Trade Openness and Volatility," *The Review of Economics and Statistics*, vol. 91(3), 558-585.

Djankov, S., C. Freund, and C.S. Pham (2010), "Trading on Time," *The Review of Economics and Statistics*, vol. 92(1), 166-173.

Easterly, W. and A. Reshef (2010), *African Export Successes: Surprises, Stylized Facts, and Explanations*, Cambridge, MA: NBER, Working Paper 16597.

EBRD (European Bank for Reconstruction and Development) (2010), *EBRD Trade Facilitation Programme: Results of the Survey of Participating Banks*, Draft Aid for Trade Case Story submitted for the preparation of the Third Global Review of Aid for Trade.

Fafchamps, M., J. Biggs, J. Conning, and P. Srivasta (1994) *Enterprise Finance in Kenya*, Regional Program on Enterprise Development, Washington, D.C.: The World Bank.

Fafchamps, M (1997). "Trade Credit in Zimbabwean Manufacturing," *World Development*, vol. 25(5), 795-815.

Feenstra, R., J. Markusen, and W. Zeile (1992), "Accounting for Growth with New Inputs: Theory and Evidence," *The American Economic Review*, vol. 92(2), 415-421.

Foch, A. (2011). *La privatisation d'Electricité de Djibouti : un échec stratégique ?* unpublished.

Frankel, Jeffrey A. and David Romer (1999), "Does Trade Cause Growth?" *The American Economic Review*, vol. 89(3), 379-399.

Freund, C. and N. Rocha (2010), *What Constrains Africa's Exports?* Washington, D.C.: World Bank, Policy Research Working Paper 5184.

Goldberg, P., A. Khandelwal, N. Pavcnik and P. Topalova (2008), *Imported Intermediate Inputs and Domestic Product Growth: Evidence from India*, Cambridge, MA: NBER, Working Paper 14416.

Grigoriou, C. (2007), *Landlockedness, Infrastructure and Trade: New Estimates for Central Asian Countries*. Washington, D.C.: World Bank, Policy research Working Paper 4335.

Grossman, G. and E. Helpman (1991), *Innovation and Growth in the Global Economy*, Cambridge, MA: MIT Press.

Gupta, S. and S. Tareq (2008), "Mobilizing Revenue," *Finance and Development*, vol. 45(3).

Hallaert, J.J. (2006), "A History of Empirical Literature on the Relationship between Trade and Growth," *Mondes en Développement*, No. 135, 2006/3, 63-77.

Hallaert, J.J. (2009), "Boosting the availability of trade finance: A priority in the current crisis?" *Intereconomics,* vol. 44(5).

Hallaert, J.J. (2010), *Increasing the Impact of Trade Expansion on Growth: Lessons from Trade Reforms for the Design of Aid for Trade*, Paris: OECD, Trade Policy Working Paper 100.

Hallaert, J.J. and L. Munro (2009), *Binding Constraints to Trade Expansion: Aid for Trade Objectives and Diagnostics Tools*, Paris: OECD, Trade Policy Working Paper 94.

Halpern, L, M. Koren, and A. Szeidl (2005), *Imports and Productivity*, London: CEPR, Discussion Paper 5139.

Harrison, A., L. Martin, and S. Nataraj (2011), *Learning Versus Stealing: How Important are Market-Share Reallocations to India's Productivity Growth?* Cambridge, MA: NBER, Working Paper 16733.

Hausmann, R., D. Rodrik, and A. Velasco (2005), *Growth Diagnostics*, unpublished, available at: www.hks.harvard.edu/fs/rhausma/new/growthdiag.pdf.

Helpman, E. and P. Krugman (1985), *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*, Cambridge, MA: MIT Press.

Hoekman, B. (2010), *Aid for Trade: Why, What, and Where Are We?* Washington, D.C.: World Bank, mimeo available at: siteresources.worldbank.org/INTRANETTRADE/Resources/239054-1273092281133/Bernard_Hoekman_Aid_For_Trade.pdf.

Hoekman, B. and J. Wilson (2010), *Aid for Trade: An Action Agenda Looking Forward*, Washington, D.C.: World Bank, Economic Premise 25.

Hummels, D (2001). *Time as a Trade Barrier*. West Lafayette: Purdue University, unpublished, available at: www.krannert.purdue.edu/faculty/hummelsd/research/time3b.pdf.

IMF (2006), *Nepal: 2005 Article IV Consultation—Staff Report; Public Information Notice on the Executive Board Discussion; and Statement by the Executive Director for Nepal*, Washington, D.C.: International Monetary Fund, Country Report 06/44.

IMF (2009), *Djibouti: 2008 Article IV Consultation and Request for a Three-Year Arrangement Under the Poverty Reduction and Growth Facility—Staff Report; Public Information Notice and Press Release on the Executive Board Discussion; and Statement by the Executive Director for Djibouti*, Washington, D.C.: International Monetary Fund, Country Report 09/216.

IMF (2010), *Nepal: Selected Issues*, Washington, D.C.: International Monetary Fund, Country Report 10/184.

ISA (International Strategic Analysis) (2011), *Azerbaijan Country Report*, January.

Jones C. and P. Romer (2010). "The New Kaldor Facts: Ideas, Institutions, Population, and Human Capital," *American Economic Journal: Macroeconomics*, vol. 2(1), 224-245.

Khandelwal, P. (2004), *COMESA and SADC: Prospects and Challenges for Regional Trade Integration*, Washington, D.C.: International Monetary Fund, Working paper WP/04/227.

Kashara, H. and J. Rodrigue (2008), "Does the use of imported intermediates increase productivity? Plant-level evidence" *Journal of Development Economics*, vol. 87(1), August, p.106-118.

Kohli, I. and N. Singh (1989), "Exports and Growth: Critical Minimum Effort and Diminishing Returns," *Journal of Development Economics*, vol. 30(2), 391-400.

Krueger, A. (2011) *Aid for Trade*, Keynote Address at the OECD Workshop on "Aid for Trade Implementation," available at: www.oecd.org/dataoecd/40/35/47460701.pdf.

Krugman, P. (1979), "Increasing Returns, Monopolistic Competition, and International Trade," *Journal of International Economics*, vol. 9(4), 469-479.

Krugman, P. (1987), "The Narrow Moving Band, the Dutch Disease, and the Consequences of Mrs. Tatcher," *Journal of Development Economics*, vol. 27(1-2), 41-55.

Krugman, P. (1993), "What Do Undergrads Need to Know About Trade," *The American Economic Review*, Papers and Proceedings, vol. 83(2), 23-26.

Lamy, P. (2009), *We must keep the foot on the gas on Aid for Trade*, Closing Remarks at the Second Global Review on Aid for Trade, available at:

www.wto.org/english/news_e/news09_e/aid_07jul09_e.htm.

Lerner, A.P. (1936), "The Symmetry Between Import and Export Taxes," *Economica*, New Series, vol. 3(11), 306-313.

Levine, R. and D. Renelt (1992), "A Sensitivity Analysis of Cross-Country Growth Regressions," *The American Economic Review*, vol. 82(4), 942-963.

Limão, N. and A. Venables (2001), "Infrastructure, Geographical Disadvantage, Transport Costs, and Trade," *The World Bank Economic Review*, vol. 15(3), 451-479.

Lucas, Robert Jr. (1988), "On the Mechanics of Economic Development," *Journal of Monetary Economics*, vol. 22(1), 3-42.

Massel, B. (1970), "Export Instability and Economic Structure", *The American Economic Review*, vol. 60(4), 618-630.

Michaely, M. (1977), "Exports and Growth: An Empirical Investigation," *Journal of Development Economics*, vol. 4(1), 49-53.

Milner, C., O. Morrissey and N. Rudaheranwa (2000), "Policy and Non-Policy Barriers to Trade and Implicit Taxation of Exports in Uganda," *Journal of Development Studies*, vol. 37(2).

Minetti, R. and S.C. Zhu (2011), "Credit Constraint and Firm Export: Microeconomic Evidence from Italy," *Journal of International Economics*, vol. 83(2), 109-125.

Melitz, M. (2003) "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, Vol. 71(6), 1695-1725.

Melitz, M. and G. Ottaviano (2008), "Market Size, Trade, and Productivity," *Review of Economic Studies,* vol. 75(1), 295-316.

Muendler (2004), *Trade, Technology, and Productivity: A Study of Brazilian Manufacturers, 1986-1998*, CESifo working paper 1148.

Nkurunziza, J.D. (2010). "The effect of credit on growth and convergence of firm size in Kenyan manufacturing," *The Journal of International Trade and Economic Development*, vol. 19(3).

Nordås, H., S. Miroudot and P. Kowalski (2006), *Dynamic Gains from Trade*, Paris: OECD, Trade Policy Working Paper 43.

Nishimizu, M. and J.M. Page, Jr. (1990), "Trade policy, Market Orientation, and Productivity Change in Industry," in J. de Melo and A. Sapir, eds., *Trade Theory and Economic Reform: North, South and East*, Oxford: Basil Blackwell.

Nishimizu, M. and S. Robinson (1984), "Trade Policies and Productivity Change in Semi-industrialized Countries," *Journal of Development Economics,* vol. 16(1-2), 177-206.

OECD/WTO (2009), *Aid for Trade at a Glance 2009 – Maintaining Momentum*, Paris and Geneva: OECD and WTO.

Page, J. (2008), *Rowing Against the Current: The Diversification Challenge in Africa's Resource-Rich Economies*, Washington, D.C.: Brookings, Global Economy and Development working Paper 29.

Paris Declaration on Aid Effectiveness (2005), www.oecd.org/dataoecd/11/41/34428351.pdf.

Pavcnik, N. (2002), "Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants," *Review of Economic Studies*, vol. 69(1), 245-276.

Pomfret, R. (2010), "Trade and Transport in Central Asia," *Global Journal of Emerging Market Economies*, vol. 2(3), 237-256.

Raballand, G., A. Kunth, and R. Auty (2005), "Central Asia's transport cost burden and its impact on trade", *Economic Systems,* vol. 29, 6–31.

Raballand, G. and P. Macchi (2008), *Transport Prices and Costs: The Need to Revisit Donors' Policies in Transport in Africa*, Washington, D.C.: mimeo, available at: ipl.econ.duke.edu/bread/papers/0809conf/Raballand.pdf.

Raballand, G., J.F. Marteau, C. Kunaka, J.K. Kabanguka, and O. Hartmann (2008), *Lessons of Corridor Performance Measurement*, Washington, D.C.: World Bank, Sub-Saharan Africa Transport Policy Program, Discussion paper 7, available at: www4.worldbank.org/afr/ssatp/Resources/SSATP-DiscussionPapers/DP07.pdf.

Roberts, M. and J. Tybout (1991), "Size Rationalization and Trade Exposure in developing Countries," In R. Baldwin *Empirical Studies of Commercial Policy*, Chicago: University of Chicago Press, 169-193.

Rodrik, D. (1992), "Closing the Productivity Gap: Does Trade Liberalization Really Help?" In G. Helleiner, *Trade Policy, Industrialization, and Development: New Perspectives*, Oxford: Clarendon Press, 155-175.

Rodrik, D. (1998), "Why Do More Open Economies Have Bigger Governments?" *The Journal of Political Economy*, vol. 106(5), 997-1032.

Rudaheranwa, N. (2006), *Trade Policy and Transport Costs in Uganda*, Nottingham: University of Nottingham, CREDIT Research Paper 06/09.

Sachs, J. and A. Warner (1995), *Natural Resource Abundance and Economic Growth*, Cambridge, MA: NBER, Working Paper 5398.

Sachs, J. and A. Warner (2001), "The Curse of Natural Resources," *European Economic Review*, vol. 45(4-6), 827-838.

Schor A. (2004), "Heterogeneous Productivity Response to Tariff Reduction: Evidence from Brazilian Manufacturing Firms," *Journal of Development Economics*, vol. 75(2), 373-396.

Stiebale J. (2011), "Do financial Constraints Matter for Foreign Market Entry? A Firm-level Examination," *World Economy*, vol. 34(1), 123-153.

Stone S. and B. Shepherd (2011), *Dynamic Gains from Trade: The Role of Intermediate Inputs and Equipment Imports*. Paris: OECD, Trade Policy Working Paper 110.

Tokarick, S. (2006), *Does Import Protection Discourage Exports?* Washington, D.C.: International Monetary Fund, Working Paper WP/06/20.

Topalova P. and A. Khandelwal (2010), "Trade Liberalization and Firm Productivity: The Case of India," forthcoming in *The Review of Economics and Statistics.*

Transit Transport Coordination Authority of the Northern Corridor (2004), *Investment Opportunities in the Northern Corridor with Emphasis in Transport Infrastructure,* A paper prepared by the TTCA Secretariat for presentation at the COMESA Business Summit in Kampale, Uganda; available at: www.oecd.org/dataoecd/22/36/34879173.pdf.

Tybout, J.R. (1992), "Linking Trade and Productivity: New Research Directions," *The World Bank Economic Review*, vol. 6(2), 189-211.

Tybout, J. and M.D. Westbrook (1995), "Trade liberalization and the dimensions of efficiency change in Mexican manufacturing industries," *Journal of International Economics*, vol. 39(1-2), 53-78.

UBOS (various years), "Statistical Abstracts." Kampala: Uganda Bureau of Statistics.

United Nations (2000), *United Nations Millennium Declaration,* Resolution adopted by the General Assembly, A/Res/55/2, available at: www.un.org/millennium/declaration/ares552e.htm.

UNDP (2007), *République de Djibouti - Rapport National de Développement Humain 2007.* New York: UNDP, available at:
hdr.undp.org/en/reports/national/arabstates/djibouti/Djibouti_RNDH_2007.pdf.

World Bank (2009), *Azerbaijan: Country Economic Memorandum — A New Silk Road: Export-led Diversification*, Washington, D.C.: World Bank, available at:
web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/AZERBAIJANEXTN/0,,contentMDK:22479745~menuPK:301919~pagePK:2865066~piPK:2865079~theSitePK:301914,00.html

World Bank (2010), *Enterprise Surveys*, available at: https://www.enterprisesurveys.org/, data accessed in September 2010.

World Bank (2011), *East Africa Trade and Transport Facilitation Project*, Aid for Trade Case Story submitted for the preparation of the Third Global Review of Aid for Trade.

World Economic Forum (2010), *The Global Competitiveness Report 2010-2011*, Geneva: World Economic Forum.

World Trade Organization (2005a), *Ministerial Declaration*, Geneva: WTO, WT/MIN(05)/DEC, available at: www.wto.org/english/thewto_e/minist_e/min05_e/final_text_e.htm.

World Trade Organization (2005b), *Ministerial Meeting of Small, Vulnerable Economies*, Geneva: WTO, WT/MIN(05)/22, WT/MIN(05)/22/Add.1, WT/MIN(05)/22/Add.2, and WT/MIN(05)/22/Add.3, available at:
www.wto.org/english/thewto_e/minist_e/min05_e/official_docs_e.htm.

World Trade Organization (2006), *Recommendations of the Task Force on Aid for Trade*, Geneva: WTO, WT/AFT/1, available at:
www.wto.org/english/tratop_e/devel_e/a4t_e/implementing_par57_e.htm.

Yanikkaya, H. (2003), "Trade Openness and Economic Growth: a Cross-Country Empirical Investigation," *Journal of Development Economics*, Vol. 72(1), 57-89.

Young, A. (1991), "Learning By Doing and the Dynamic Effects of International Trade," *Quarterly Journal of Economics*, vol. 106(2), 369-405.

Appendix 1.

Model and estimation method

The model used to determine the impact of the variables identified as the binding constraints on trade and, subsequently, the impact of trade on growth is composed of two stages. In the first stage, it quantifies the magnitude and direction of the direct effect of the binding constraints on trade indicators (exports, imports, and openness). In the second stage, the model quantifies the magnitude and direction of the composite effect of the binding constraints on the economy's growth rate through their effect on trade indicators. This procedure isolates the explained variation in trade accounted by the binding constraints on the economy's growth rate by using the Two Stage Least Squares estimator (TSLS). Contrary to conventional applications of the econometric estimator, in this application, the first stage of the model is equally as important as the second. Therefore, the variables to be included in each stage need to be chosen carefully.

his approach explicitly looks at the supply side determinants of trade in the first stage and, subsequently, in the second stage looks, at the impact of trade on growth. We assume the binding constraints variables affect the countries' trade shares and these trade shares affect GDP growth.

Model specification

The model's specification of the impact of trade on growth is the following:

$$\Delta GDP = \alpha_0 + \alpha_1 GDP_{t0} + \alpha_2 Trade_{it} + \alpha_3 Investment + X\beta + \omega_{it}, \quad (1)$$

where ΔGDP is the change in real GDP, GDP_{t0} represents initial GDP, $Tade_{it}$ is the trade indicator (exports, imports, or openness), $Investment$ is the amount of investment in the country as a share of GDP (investment is part of this equation as it is a key determinant of growth and because literature has shown that it is an important channel of the impact of trade on growth), X is a vector of other variables affecting GDP growth, ω_{it} represents the regression error term, and the α_k and β_k are parameters to be estimated.

The first stage is specified as follows:

$$Trade_{it} = W\delta + \tau * GDP_{it-1} + \varepsilon_{it}, \qquad (2)$$

where $Trade_{it}$ is defined as above; W is a vector of variables including all exogenous variables in the model which determine the country's level of trade, this includes the ones related to the binding constraints and a constant; GDP represents initial GDP , τ is a parameter to be estimated, ε_i represents the regression error term, and δ_n are parameters to be estimated.

Distinguishing the direct and indirect effect of the binding constraints on growth.

Moreover, the model isolates the direct effect of the variables related to the binding constraints on a country's economic growth rate and their indirect effect on the growth rate through trade.

In this case, the impact of trade on the economy's growth rate is captured by $\hat{\alpha}_2$. Since the change of the growth rate in GDP when the trade indicator changes can be expressed as

$$\frac{\partial \Delta GDP}{\partial Trade} = \hat{\alpha}_2, \qquad (3)$$

and the impact of the kth binding constraint inhibiting trade performance on the economy's growth rate can be expressed as the following:

$$\frac{\partial \Delta GDP}{\partial W_k} = \frac{\partial \Delta GDP}{\partial X_k} + \frac{\partial \Delta GDP}{\partial Trade}\frac{\partial Trade}{\partial W_k}$$

$$= \underbrace{\widetilde{\beta_k}}_{Direct\ effect} + \underbrace{\widetilde{\hat{\alpha}_2 * \delta_k}}_{Indirect\ effect},$$

that is, the change in the growth rate in GDP when the kth binding constraint changes is the sum of the change of the growth rate in GDP when the kth binding constraint changes (direct effect i.e. the direct effect of the binding constraint on growth) and the change of the growth rate of GDP when the trade indicator changes multiplied by the change of the trade indicator when the kth binding constraint changes (indirect effect i.e. effect of the binding constraint on growth through its impact on trade). These effects are captured by the parameters estimated in the model. The total effect of any binding constraint can be quantified in an analogous manner.

Estimation method

The motive for using the TSLS estimator is the presence of an endogenously determined variable in the growth regression, the level of trade. Previous literature such as Frankel and Romer (1999) has documented reverse causality between trade levels and GDP growth. In essence, when a country has its income grow it increases consumption of all type of goods domestic and imported, which gradually translates into later growth because some of these imports are higher quality intermediate inputs which increase labor's productivity and increase the quality of the goods produced within the country. These goods can later be sold in international markets increasing exports. Therefore, the TSLS estimator is used as a consequence of the presence of reverse causality between the variables included in the regression model. Recall, reverse causality violates the first assumption of the classical linear regression model. That is, one of the reasons as to why the expected value of the regression error term given the data is not equal to zero, i.e. $E(\varepsilon_i \mid X) \neq 0$.

When the first assumption of the linear regression model is violated the parameter estimates will not be consistent and in large samples will not approach the true population values. This bias persists and the researchers must adjust the estimation technique to

correct this problem. A solution is to use variables called "instruments" to obtain consistent parameter estimates of the unknown coefficients of the population regression function. These instruments must satisfy two conditions. First, the instruments must be correlated with the endogenous variable. Second, the instruments must not be correlated with the regression's error term. The TSLS estimator uses the instruments in the first stage to decompose the endogenous variable into two components by regressing the endogenous variable on the instruments and all other exogenous variables in the model. This regression isolates the variation of the endogenous variable accounted by the instruments from the residual variation which may still be correlated with the regression model's error term. The second stage uses the isolated variation of the endogenous variable, no longer correlated with the regression model's error term, to estimate the parameters of interest.

The procedure to obtain parameter estimates is as follows. Estimate the regression stated in equation (2) by ordinary least squares to obtain the predicted values. Substitute the recently calculated predicted values for the trade variable in equation (1) as explanatory variable and run a regression through ordinary least squares. This two stage procedure yields consistent parameter estimates which are critical for inference and internal validity considerations.

The two-stage least squares estimator in matrix form

The Two Stage Least Squares estimator is the instrumental variables estimator in which the instruments are the predicted values of X based on OLS estimation of the first stage regression. Let $\widehat{X}$ denote this matrix of predicted values, so that the ith row of $\widehat{X}$ is $\left(1, \ \hat{X}_{1i}, \ \hat{X}_{2i}, ..., \hat{X}_{Ki}, \hat{W}_{1i}, \hat{W}_{2i}, ..., \hat{W}_{ri}\right)$ where $\hat{X}_{1i}$ is the predicted value from the regression of X_{1i} on Z and so forth. Because the W's are contained in Z, the predicted value from a regression of W_{1i} on Z is just W_{1i}, and so forth, so $\widehat{X} = P_Z X$ where $P_Z = Z(Z'Z)^{-1}Z'$. Accordingly, the Two Stage Least Squares estimator is

$$\hat{\beta}^{TSLS} = \left(\widehat{X}'X\right)^{-1}\widehat{X}'Y$$

Because $\widehat{X} = P_Z X$, $\widehat{X}'X = X'P_Z X = \widehat{X}'\widehat{X}$, and $\widehat{X}'Y = X'P_Z Y$ the TSLS estimator can be rewritten as

$$\hat{\beta}^{TSLS} = (X'P_Z X)^{-1}X'P_Z Y$$

The asymptotic distribution of the TSLS Estimator

Take a linear regression model of the form:

$$Y = X\beta + U$$

and substitute it into the expression for the TSLS estimator to obtain:

$$\hat{\beta}^{TSLS} = (X'P_Z X)^{-1}X'P_Z Y$$
$$= (X'P_Z X)^{-1}X'P_Z (X\beta + U)$$
$$= (X'P_Z X)^{-1} X'P_Z X\beta + \ (X'P_Z X)^{-1}X'P_Z U$$
$$= \beta + (X'P_Z X)^{-1}X'P_Z U$$
$$\hat{\beta}^{TSLS} - \beta = (X'P_Z X)^{-1}X'P_Z U$$

Multiply both sides by $\sqrt[2]{n}$ to obtain

$$\sqrt[2]{n}(\hat{\beta}^{TSLS} - \beta) = \frac{(X'P_Z X)^{-1} X'P_Z U}{n} \frac{}{\sqrt[2]{n}}$$

$$= \frac{(X'Z(Z'Z)^{-1}Z'X)^{-1}}{n} \frac{X'Z(Z'Z)^{-1}Z'U}{\sqrt[2]{n}}$$

$$= \left[\frac{X'Z}{n}\left(\frac{(Z'Z)}{n}\right)^{-1}\frac{Z'X}{n}\right]^{-1}\left[\frac{X'Z}{n}\left(\frac{(Z'Z)}{n}\right)^{-1}\frac{Z'U}{\sqrt[2]{n}}\right]$$

Where the second equality uses the definition of P_Z. Under the IV regression assumptions $\frac{X'Z}{n} \xrightarrow{p} Q_{XZ}$ and $\frac{Z'Z}{n} \xrightarrow{p} Q_{ZZ}$ where $Q_{XZ} = E(X_i Z_i')$ and $Q_{ZZ} = E(Z_i Z_i')$. In addition, under the IV regression assumptions $Z_i U_i$ is independent and identically distributed with mean zero and a non-zero finite variance, so its sum divided by $\sqrt[2]{n}$ satisfies the conditions for the central limit theorem and

$$\frac{Z'U}{\sqrt[2]{n}} \xrightarrow{d} \Psi_{ZU} \text{ where } \Psi_{ZU} \sim N(0, H) \text{ and } H = E(Z_i Z_i' u_i^2), \text{ where } \Psi_{ZU} \text{ is } (m+r+1) \times 1$$

Therefore, application of the above expression and the limits $\frac{X'Z}{n} \xrightarrow{p} Q_{XZ}$ and $\frac{Z'Z}{n} \xrightarrow{p} Q_{ZZ}$ yields the result that, under the IV regression assumptions, the TSLS estimator is asymptotically normally distributed:

$$\sqrt[2]{n}(\hat{\beta}^{TSLS} - \beta) \xrightarrow{d} (Q_{XZ}Q_{ZZ}^{-1}Q_{ZX})^{-1}Q_{XZ}Q_{ZZ}^{-1}\Psi_{ZU} \sim N(0, \Sigma^{TSLS}),$$

where

$$\Sigma^{TSLS} = (Q_{XZ}Q_{ZZ}^{-1}Q_{ZX})^{-1}Q_{XZ}Q_{ZZ}^{-1}HQ_{ZZ}^{-1}Q_{ZX}(Q_{XZ}Q_{ZZ}^{-1}Q_{ZX})^{-1}$$

where $H = E(Z_i Z_i' u_i^2)$.

Standard errors for TSLS

The above expression for Σ^{TSLS} provides a wat to estimate it by substituting sample moments for the population moments. The resulting variance estimator is the following:

$$\hat{\Sigma}^{TSLS} = \left(\hat{Q}_{XZ}\hat{Q}_{ZZ}^{-1}\hat{Q}_{ZX}\right)^{-1}\hat{Q}_{XZ}\hat{Q}_{ZZ}^{-1}\hat{H}\hat{Q}_{ZZ}^{-1}\hat{Q}_{ZX}\left(\hat{Q}_{XZ}\hat{Q}_{ZZ}^{-1}\hat{Q}_{ZX}\right)^{-1}$$

where $\hat{Q}_{XZ} = \frac{X'Z}{n}, \hat{Q}_{ZZ} = \frac{Z'Z}{n}, \hat{Q}_{ZX} = \frac{Z'X}{n}, and \hat{H} = \frac{1}{n}\sum_{i=1}^{n} Z_i Z_i' \hat{u}_i^2$, where $\hat{U} = Y - X\hat{\beta}^{TSLS}$

where $\hat{U}$ is the vector of TSLS residuals and $\hat{u}_i$ is the ith element of that vector (the TSLS residuals for the ith observation). The TSLS standard errors are the square roots of the diagonal elements of $\hat{\Sigma}^{TSLS}$.

Dealing with possible endogeneity

Equation (2) explains the trade indicator as a function of the aid-for-trade variables. The purpose is to test explicitly the impact of each binding constraint on trade. Most of these variables change slowly through time so we consider them fixed in the short run (contemporaneously to the trade indicator) and thus exogenous. In Equation (1), predicted values coming from equation (2) for the trade indicator (exports, imports, or openness) are used. As a result, as much endogeneity as possible has been removed from the trade

indicator (which is the focus variable with the ones describing the binding constraints). Moreover, the endogeneity is purged out of GDP because lagged GDP is used (no endogeneity between variables at different periods in time). Some endogeneity issues could still be present regarding the shares of investment and government spending in the growth equation, but these should be minimal.

Fixed effects

In theoretical terms, the inclusion of country fixed effects would account for unobserved heterogeneity or any other country specific characteristic that is difficult to measure. However, in a study such as this one, special care should be taken when deciding to include fixed effects. The inclusion of fixed effects causes the econometric estimator to ignore the cross-country variation and focuses exclusively on the within-country variation. In a situation where there are limited country observations, and where these have limited variation across time, and thus behave as a fixed factor, the reduction in bias by including fixed effects increases the parameters' standard errors. Other methods which have been used to account for unobserved heterogeneity (for example, first differencing the data) in such a setting increases statistical measurement error and imprecise estimates are obtained. This is a consequence of the limited variation in the data across time which forces the identification of the binding constraints to come from cross-country variation. Therefore, the fixed effects were not included and further investigation on heterogeneity was made in smaller country groupings. This course of action reduced the variance of the parameter estimates and allowed us to look into the parameter heterogeneity and omitted variables within different country groupings.

Lagged values

This study does not include lagged values of explanatory variables in the econometric specification unless there was a clear case of contemporaneous correlation among the variable in question and the regression error term. The use of lagged values due to other reasons generates several problems. On one hand, there is the question of how many lags to include as there is no *ex ante* rule which encompasses every possible case for every possible variable. On the other hand, the issue of a limited number of observations and limited variation across time by which the inclusion of lags would have had as a result the use of the same figure. Therefore, the econometric specifications ran and tested were constructed with the idea of identifying the binding constraints as precisely and as parsimoniously as possible. This implies tradeoffs as we focused on explaining the variation of the trade indicators as thoroughly as possible, perhaps foregoing looking into greater detail on the particular processes, time effects, or simultaneous determination that affect other variables such as investment and government expenditures.

Taking into account heteroskedaticity

Finally, with inference in mind (that is being able to extract as many lessons as possible from the study of the unrestricted sample, as well as from the different country groupings) we employed heteroskedastcity robust standard errors throughout the econometric estimation. Failure to account for heteroskedasticity in the various samples would produce inconsistent standard errors resulting in hypotheses tests with size differing from the desired significance level and confidence intervals that would not include the true value of the parameter for the desired percentage of time.

Appendix 2.

Data sources and definition of the variables

Air_trans_carr_dep refers to domestic takeoffs and takeoffs abroad of air carriers registered in the country. The figures come from the International Civil Aviation Organization (ICAO), Civil Aviation Statistics of the World and ICAO staff estimates.

Dom_credit represents the amount of credit extended by banks and other financial institutions to the private sector as a share of GDP. The data are from the April 2010 version of the Database on Financial Development and Structure compiled by Beck, Demirguc-Kunt, and Levine.

Electric_cons_percap stands for Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants. The data are from the World Bank's World Development Indicators.

Electric_power_losses_p_out stands for electric power transmission and distribution losses (percent of output) that include losses in transmission between sources of supply and points of distribution and in the distribution to consumers, including pilferage. The data are from the World Bank's World Development Indicators.

Exports and Imports include goods and services and the data are from the International Monetary Fund's International Financial Statistics (IFS), all in US dollars.

GDP is the gross domestic product in current US dollars and the data are from the World Bank's World Development Indicators.

Gfcf stands for gross fixed capital formation and consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories as a share of GDP. The figures are from World Bank national accounts data, and OECD National Accounts data files.

Government_spending represents government spending (including consumption and transfers) as a percentage of GDP. In most cases, general government expenditure data include all levels of government such as federal, state, and local. In cases where general government spending data are not available, data on central government expenditure are used instead. Data are from the Heritage Foundation.

Gov_spending_imf refers to the total expense plus the net acquisition of nonfinancial assets. Data are from the International Monetary Fund's Government Finance Statistics.

Gov_revenue_imf represents all transactions that increase the net worth of the general sector classified as revenue. Data are from the International Monetary Fund's Government Finance Statistics.

Gov_taxrevenue refers to compulsory transfers to the central government sector for public purposes. Data are from the International Monetary Fund's Government Finance Statistics.

Herfindhal is calculated at HS-4-digit level and the export data are from the United Nations Commodity Trade database (COMTRADE). The Herfindhal Index ranges from 0 to 1 with 1 being the concentration on 1 tariff line.

L_force is the total labor force comprising people aged 15 and older who meet the International Labour Organization definition of the economically active population. Figures are from the International Labour Organization, using World Bank population estimates.

Productivity_per_worker figures come from the United Nations Industrial Development Organization's World Productivity Database.

Property_rights measures the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. It also assesses the likelihood that private property will be expropriated and analyzes the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and businesses to enforce contracts. The more certain the legal protection of property, the higher a country's score. Similarly, the greater the chances of government expropriation of property, the lower a country's score. The index ranks from 0 to 100. Data are from the Heritage Foundation.

REER is the real effective exchange rate (CPI based). Data are from the International Monetary Fund (INS and IFS).

Railkm2 is the total railway network (length of railway route available for train service, irrespective of the number of parallel tracks) divided by the total land area of the country measured in kilometers square. Data on the rail lines are from the World Bank**'s** Transportation, Water, and Urban Development Department and accessible on the

Raw materials does not refer to a right-handside variable in the econometric work. It is used to define commodity exporters. Export data are from Comtrade and raw materials refers to the following HS-6-digits tariff lines: 010119-010120; 010290; 010391-020890; 030110-030490; 030611-030619; 030710-030721; 030731; 030741; 030751; 030760-030791; 040110-040130; 040700; 040900-060291; 070110-071090; 071410-090111; 100110-100620; 100700-100890; 120100-120799; 120911-140490; 152200; 180100; 230210-230330; 230810-230890; 240110-240130; 250200-252010; 252100; 252400-270119; 270210; 270300; 270900; 271410-271490; 310100; 310410; 391510-391590; 400110-400130; 400400; 410110-410390; 411000; 430110-430190; 440110-440130; 440310-440399; 450110-450190; 470710-470790; 500100-500390; 510111-510330; 520100-520299; 530110; 530130; 530410-530519; 550510-550520; 631010-631090; 701010-701090; 710110-710221; 710231; 710510-710590; 711210-711290; 720410-720450; 740400; 750300; 760200; 780200; 790200; 800200; 810191; 810291; 810310; 810420; 810510; 810600-810710; 810810; 810910; 811000-811211; 811300; 854800.

Roadkm2 refers to the total road network divided by the total land area of the country measured in kilometers square. Data on the road network from the International Road Federation, World Road Statistics and electronic files.

Road_paved refers to the paved roads, as a percentage of all the country's roads, measured in length. The data are from the International Road Federation, World Road Statistics and electronic files.

Secschoolenroll stands for secondary school enrolment ratio. Enrollment ratio is the ratio of total enrollment to the population of the age group that officially corresponds to the level of education shown. Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers. Data are from the World Bank's World Development Indicators.

Simple_average1_AHS is the applied tariff and data are from the United Nations Conference on Trade and Development's Trade Analysis Information System (TRAINS).

Simple_average3_MFN is the simple average rate of MFN tariff and data are from the United Nations Conference on Trade and Development's Trade Analysis Information System (TRAINS), WTO, and the World Bank's World Trade Indicators.

Tel100pop stands for the number of fixed telephone lines for 100 habitants. Telephone lines are lines that connect a subscriber's terminal equipment to the public switched telephone network and that have a port on a telephone exchange. Integrated services digital network channels and fixed wireless subscribers are included. Data are from the World Bank's World Development Indicators.

Teldensity stands for the number of fixed telephone lines and cell phone for 100 habitants. Data are from the World Bank's World Development Indicators.

Appendix 3.

List of countries

Total number of countries: 65

Unrestricted sample (36 countries)*

Argentina			Guatemala	Panama
Bangladesh		India	Paraguay	
Bolivia			Indonesia	Peru
Cameroon			Jamaica	Philippines
Chile			Jordan	Senegal
Colombia			Kenya	Sri Lanka
Costa Rica		Malaysia		Thailand
Dominican Republic	Morocco	Trinidad and Tobago		
Ecuador			Mozambique	Tunisia
El Salvador		Nepal	Turkey	
Ethiopia			Nicaragua	Uruguay
Ghana			Pakistan	Venezuela

*Thirty-six countries when productivity is considered, 47 when secondary school enrolment is considered. Some countries are considered in the subsamples but not in the unrestricted sample because some of the data needed for the unrestricted sample specification were not available

Landlocked countries (9 countries)	Small and Vulnerable Economies (36 countries)		Commodity Exporters (19 countries)
Belarus	Albania	Jordan	Benin
Bolivia	Barbados	Kyrgyz Republic	Botswana
Botswana	Belize	Malawi	Cameroon
Ethiopia	Benin	Mali	Colombia
Kazakhstan	Bolivia	Mauritius	Ecuador
Mongolia	Botswana	Mongolia	Ethiopia
Nepal	Burkina Faso	Nicaragua	Haïti
Paraguay	Burundi	Niger	Honduras
Zambia	Cambodia	Panama	Iran, Islamic Republic of
	Costa Rica	Papua New Guinea	Kazakhstan
	Dominican Republic	Paraguay	Mongolia
	Ecuador	Rwanda	Namibia
	El Salvador	Senegal	Nicaragua
	Fiji	Swaziland	Oman
	Guatemala	Togo	Panama
	Guyana	Trinidad and Tobago	Paraguay
	Haïti	Zambia	Saudi Arabia
	Honduras		Uruguay
	Jamaica		Venezuela

Appendix 4.

Alternative regressions for the unrestricted sample

Table A4.1: Unrestricted sample – Alternative import tariffs variable

	Core results			Alternative regression		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.287***	-0.413***	-0.192**	-0.117*	-0.161*	-0.062
	(0.0906)	(0.106)	(0.0814)	(0.0679)	(0.0824)	(0.0647)
l_air_trans_carr_dep	0.101***	0.195***	0.039	0.056	0.101	0.006
	(0.0388)	(0.0574)	(0.0343)	(0.0520)	(0.0729)	(0.0450)
l_roadkm2	0.097***	0.082**	0.111***	0.107***	0.101*	0.107***
	(0.0280)	(0.0405)	(0.0238)	(0.0380)	(0.0549)	(0.0300)
l_electric_power_losses_p_out	-0.185***	-0.240**	-0.170***	-0.290***	-0.347**	-0.285***
	(0.0666)	(0.0984)	(0.0546)	(0.0912)	(0.149)	(0.0736)
l_dom_credit	0.176**	0.004	0.290***	0.154	0.0124	0.277***
	(0.0866)	(0.117)	(0.0733)	(0.0988)	(0.149)	(0.0809)
Simple_average3_mfn	**-0.013****	**-0.014****	**-0.011****			
	(0.00561)	**(0.00670)**	**(0.00506)**			
Simple_average1_AHS				**-0.017****	**-0.018****	**-0.015****
				(0.00788)	**(0.00996)**	**(0.00682)**
l_gfcf1	0.423*	0.218	0.507**	0.293*	0.168	0.349**
	(0.254)	(0.294)	(0.228)	(0.174)	(0.243)	(0.136)
l_property_rights	0.229	0.496**	0.159	-0.141	0.0651	-0.214
	(0.167)	(0.219)	(0.149)	(0.210)	(0.299)	(0.182)
l_l_force	0.138**	0.263***	0.055	0.097	0.170	0.0323
	(0.0674)	(0.0857)	(0.0594)	(0.0910)	(0.109)	(0.0793)
l_productivitity_per_worker	0.122*	0.309***	-0.027	0.010	0.125	-0.099
	(0.0736)	(0.0942)	(0.0664)	(0.0754)	(0.120)	(0.0660)
l_reer	-0.678*	-0.696	-0.572*	-0.186	-0.109	-0.192
	(0.367)	(0.440)	(0.332)	(0.261)	(0.416)	(0.202)
l_government_spending	-1.570***	-1.840***	-1.404***	-0.709**	-0.797*	-0.582***
	(0.510)	(0.571)	(0.479)	(0.284)	(0.440)	(0.212)
Landlocked	-0.501***	-0.709***	-0.359***	-0.259	-0.310	-0.226*
	(0.126)	(0.179)	(0.113)	(0.163)	(0.259)	(0.133)
Island	0.005	0.019	-0.033	0.231	0.339*	0.138
	(0.137)	(0.163)	(0.129)	(0.160)	(0.184)	(0.163)
Constant	-2.972	-3.994	-4.095	-8.849***	-11.18***	-9.107***
	(3.778)	(4.230)	(3.493)	(1.919)	(2.834)	(1.518)
Observations	175	176	176	87	87	87
R-squared	0.454	0.411	0.503	0.659	0.492	0.754
Trade variable in growth estimate	0.081	0.054	0.102	0.193	0.134	0.283
	(0.0885)	(0.0607)	(0.127)	(0.226)	(0.152)	(0.349)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Table A4.2: Unrestricted sample – Alternative electricity variable

	Core results			Alternative regression		
	Openness	Exports	Imports	Openness	Exports	Imports
Loggdp1	-0.287***	-0.413***	-0.192**	-0.324***	-0.470***	-0.221***
	(0.0906)	(0.106)	(0.0814)	(0.0786)	(0.0911)	(0.0713)
l_air_trans_carr_dep	0.101***	0.195***	0.039	0.122***	0.209***	0.0681
	(0.0388)	(0.0574)	(0.0343)	(0.0468)	(0.0671)	(0.0426)
l_roadkm2	0.097***	0.082**	0.111***	0.141***	0.136***	0.151***
	(0.0280)	(0.0405)	(0.0238)	(0.0312)	(0.0393)	(0.0269)
l_electric_power_losses_p _out	**-0.185*** **	**-0.240** **	**-0.170*** **			
	(0.0666)	**(0.0984)**	**(0.0546)**			
l_electric_cons_percap				**-0.060**	**-0.0271**	**-0.106**
				(0.0864)	**(0.121)**	**(0.075)**
l_dom_credit	0.176**	0.004	0.290***	0.111	-0.0724	0.225***
	(0.0866)	(0.117)	(0.0733)	(0.0919)	(0.121)	(0.0800)
Simple_average3_mfn	-0.013**	-0.014**	-0.011**	-0.018***	-0.020***	-0.015***
	(0.00561)	(0.00670)	(0.00506)	(0.00521)	(0.00620)	(0.00471)
l_gfcf1	0.423*	0.218	0.507**	0.547**	0.363	0.623**
	(0.254)	(0.294)	(0.228)	(0.269)	(0.308)	(0.244)
l_property_rights	0.229	0.496**	0.159	0.410***	0.714***	-0.339***
	(0.167)	(0.219)	(0.149)	(0.151)	(0.211)	(0.130)
l_l_force	0.138**	0.263***	0.055	0.183***	0.338***	0.0829
	(0.0674)	(0.0857)	(0.0594)	(0.0690)	(0.0850)	(0.0610)
l_productivitity_per_ worker	0.122*	0.309***	-0.027	0.165*	0.330**	-0.053
	(0.0736)	(0.0942)	(0.0664)	(0.0994)	(0.133)	(0.0887)
l_reer	-0.678*	-0.696	-0.572*	-0.543	-0.532	-0.447
	(0.367)	(0.440)	(0.332)	(0.333)	(0.406)	(0.301)
l_government_spending	-1.570***	-1.840***	-1.404***	-1.644***	-1.911***	-1.523***
	(0.510)	(0.571)	(0.479)	(0.459)	(0.522)	(0.431)
Landlocked	-0.501***	-0.709***	-0.359***	-0.397***	-0.580***	-0.273**
	(0.126)	(0.179)	(0.113)	(0.141)	(0.187)	(0.131)
Island	0.005	0.019	-0.033	-0.0657	0.0755	-0.0906
	(0.137)	(0.163)	(0.129)	(0.148)	(0.177)	(0.137)
Constant	-2.972	-3.994	-4.095	-4.204	-5.459	-5.093*
	(3.778)	(4.230)	(3.493)	(3.216)	(3.631)	(2.967)
Observations	175	176	176	183	184	184
R-squared	0.454	0.411	0.503	0.452	0.402	0.504
Trade variable in growth estimate	0.081	0.054	0.102	0.0883	0.456	0.098
	(0.0885)	(0.0607)	(0.127)	(0.122)	(0.385)	(0.180)

Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Authors' calculations.

Table A4.3. Unrestricted sample – Alternative road variable

	Core results			Alternative regression		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.287***	-0.413***	-0.192**	-0.371***	-0.566***	-0.216***
	(0.0906)	(0.106)	(0.0814)	(0.0814)	(0.100)	(0.0741)
l_air_trans_carr_dep	0.101***	0.195***	0.039	0.122***	0.259***	0.023
	(0.0388)	(0.0574)	(0.0343)	(0.0359)	(0.0544)	(0.0320)
l_roadkm2	**0.097***	**0.082**	**0.111***			
	(0.0280)	**(0.0405)**	**(0.0238)**			
l_road_paved				**0.179*	**0.121**	**0.178*
				(0.0963)	**(0.112)**	**(0.0895)**
l_electric_power_losses_p_o ut	-0.185***	-0.240**	-0.170***	-0.100	-0.131	-0.135**
	(0.0666)	(0.0984)	(0.0546)	(0.063)	(0.0930)	(0.0544)
l_dom_credit	0.176**	0.004	0.290***	0.049	-0.221**	0.246***
	(0.0866)	(0.117)	(0.0733)	(0.0714)	(0.104)	(0.0647)
Simple_average3_mfn	-0.013**	-0.014**	-0.011**	-0.017***	-0.0202***	-0.011**
	(0.00561)	(0.00670)	(0.00506)	(0.00509)	(0.00636)	(0.00458)
l_gfcf1	0.423*	0.218	0.507**	0.624***	0.627***	0.568***
	(0.254)	(0.294)	(0.228)	(0.202)	(0.241)	(0.190)
l_property_rights	0.229	0.496**	0.159	0.250*	0.342*	0.257**
	(0.167)	(0.219)	(0.149)	(0.151)	(0.201)	(0.129)
l_l_force	0.138**	0.263***	0.055	0.100	0.273***	-0.0249
	(0.0674)	(0.0857)	(0.0594)	(0.0607)	(0.0786)	(0.0553)
l_productivitity_per_ worker	0.122*	0.309***	-0.027	0.171***	0.453***	-0.023
	(0.0736)	(0.0942)	(0.0664)	(0.0649)	(0.0946)	(0.0554)
l_reer	-0.678*	-0.696	-0.572*	-0.898**	-1.036**	-0.802**
	(0.367)	(0.440)	(0.332)	(0.354)	(0.421)	(0.325)
l_government_spending	-1.570***	-1.840***	-1.404***	-1.322***	-1.737***	-0.965***
	(0.510)	(0.571)	(0.479)	(0.335)	(0.422)	(0.317)
Landlocked	-0.501***	-0.709***	-0.359***	-0.495***	-0.714***	-0.345***
	(0.126)	(0.179)	(0.113)	(0.119)	(0.186)	(0.0966)
Island	0.005	0.019	-0.033	0.085	0.091	0.069
	(0.137)	(0.163)	(0.129)	(0.159)	(0.184)	(0.151)
Constant	-2.972	-3.994	-4.095	-3.001	-2.521	-5.136**
	(3.778)	(4.230)	(3.493)	(2.700)	(3.231)	(2.474)
Observations	175	176	176	190	191	191
R-squared	0.454	0.411	0.503	0.460	0.411	0.500
Trade variable in growth estimate	0.081	0.054	0.102	0.166*	0.109*	0.238
	(0.0885)	(0.0607)	(0.127)	(0.0936)	(0.0616)	(0147)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Table A4.4. Unrestricted sample – Alternative fiscal variable

	Core results			Alternative regression		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.287***	-0.413***	-0.192**	-0.068	0.037	-0.118
	(0.0906)	(0.106)	(0.0814)	(0.130)	(0.145)	(0.114)
l_air_trans_carr_dep	0.101***	0.195***	0.039	0.043	0.037	-0.009
	(0.0388)	(0.0574)	(0.0343)	(0.102)	(0.128)	(0.079)
l_roadkm2	0.097***	0.082**	0.111***	0.152***	0.229***	0.092*
	(0.0280)	(0.0405)	(0.0238)	(0.0549)	(0.0672)	(0.0468)
l_electric_power_losses_p_out	-0.185***	-0.240**	-0.170***	-0.383**	-0.728***	-0.226
	(0.0666)	(0.0984)	(0.0546)	(0.169)	(0.204)	(0.147)
l_dom_credit	0.176**	0.004	0.290***	0.113	-0.090	0.279**
	(0.0866)	(0.117)	(0.0733)	(0.139)	(0.180)	(0.109)
Simple_average3_mfn	-0.013**	-0.014**	-0.011**	-0.017***	-0.023***	-0.011**
	(0.00561)	(0.00670)	(0.00506)	(0.00516)	(0.00652)	(0.00428)
l_gfcf1	0.423*	0.218	0.507**	0.324	0.265	0.283
	(0.254)	(0.294)	(0.228)	(0.250)	(0.306)	(0.208)
l_property_rights	0.229	0.496**	0.159	0.164	0.215	0.154
	(0.167)	(0.219)	(0.149)	(0.244)	(0.294)	(0.213)
l_l_force	0.138**	0.263***	0.055	0.112	0.226	0.071
	(0.0674)	(0.0857)	(0.0594)	(0.152)	(0.181)	(0.132)
l_productivitity_per_ worker	0.122*	0.309***	-0.027	-0.0806	-0.107	-0.069
	(0.0736)	(0.0942)	(0.0664)	(0.128)	(0.152)	(0.112)
l_reer	-0.678*	-0.696	-0.572*	0.209	0.403	0.205
	(0.367)	(0.440)	(0.332)	(0.329)	(0.425)	(0.260)
l_government_spending	**-1.570***	**-1.840***	**-1.404***			
	(0.510)	**(0.571)**	**(0.479)**			
l_gov_taxrevenue				**0.728***	**1.156***	**0.502**
				(0.239)	**(0.279)**	**(0.212)**
Landlocked	-0.501***	-0.709***	-0.359***	-0.101	-0.409	0.151
	(0.126)	(0.179)	(0.113)	(0.321)	(0.372)	(0.276)
Island	0.005	0.019	-0.033	0.011	-0.189	0.103
	(0.137)	(0.163)	(0.129)	(0.164)	(0.205)	(0.142)
Constant	-2.972	-3.994	-4.095	-16.58***	-21.11***	-15.76***
	(3.778)	(4.230)	(3.493)	(2.603)	(3.184)	(2.180)
Observations	175	176	176	74	74	75
R-squared	0.454	0.411	0.503	0.746	0.726	0.803
Trade variable in growth estimate	0.081	0.054	0.102	1.600	0.348	-0.652
	(0.0885)	(0.0607)	(0.127)	(5.369)	(0.473)	(0.791)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Appendix 5.

Alternative regressions for landlocked countries

Table A5.1: Landlocked countries – Alternative electricity variables

	Availability			Reliability		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.014	-0.034	-0.016	0.033	0.149**	-0.054
	(0.0197)	(0.0211)	(0.0294)	(0.0449)	(0.0691)	(0.0447)
l_roadkm2	-0.016	-0.043*	0.011	0.146***	0.117*	0.163***
	(0.0159)	(0.0246)	(0.0262)	(0.0376)	(0.0593)	(0.0327)
l_electric_cons_percap	**0.201***	**0.405***	**0.089**			
	(0.022)	**(0.0339)**	**(0.0341)**			
l_electric_power_losses_ p_out				**-0.138***	**-0.180**	**-0.140***
				(0.072)	**(0.152)**	**(0.0447)**
Simple_average3_mfn	-0.008	-0.007	-0.006	-0.042***	-0.068***	-0.025***
	(0.00611)	(0.0108)	(0.00987)	(0.00709)	(0.0142)	(0.00418)
l_gfcf1	0.354***	0.278***	0.299**	-0.503**	-1.193***	-0.088
	(0.0729)	(0.0918)	(0.124)	(0.228)	(0.359)	(0.195)
l_reer	-1.080***	-0.892***	-1.053***	-0.501	-0.390	-0.368*
	(0.171)	(0.218)	(0.271)	(0.339)	(0.860)	(0.180)
l_gov_spending	-0.205**	-0.242***	-0.256*	-0.535*	-0.503	-0.740**
	(0.0888)	(0.0851)	(0.135)	(0.221)	(0.339)	(0.257)
Constant	-10.71***	-13.23***	-9.999***	--6.965**	-9.263**	-6.364**
	(0.806)	(1.112)	(1.069)	(2.573)	(3.867)	(2.315)
Observations	50	51	50	23	24	23
R-squared	0.932	0.963	0.748	0.934	0.918	0.919
Trade variable in growth estimate	0.269	0.327	0.276	0.307	0.431	0.418
	(0.260)	(0.289)	(0.294)	(0.701)	(1.446)	(0.860)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Table A5.2: Landlocked countries – Alternative fiscal variables

	Fiscal variable: spending			Fiscal variable: revenue		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**
Loggdp1	-0.027	-0.038	-0.028	-0.043	-0.064	-0.039
	(0.0510)	(0.0473)	(0.0616)	(0.0615)	(0.0644)	(0.0743)
l_roadkm2	0.041	0.000	0.121***	0.084	0.046	0.156**
	(0.0335)	(0.0401)	(0.0409)	(0.0541)	(0.0576)	(0.0608)
l_roadpaved	-0.109*	-0.075	-0.215***	-0.166	-0.150	-0.251**
	(0.0586)	(0.0651)	(0.0588)	(0.0989)	(0.103)	(0.105)
l_electric_cons_percap	0.223***	0.410***	0.131***	0.229***	0.429***	0.125**
	(0.0344)	(0.0376)	(0.0431)	(0.0387)	(0.0518)	(0.0542)
l_dom_credit	-0.073	-0.119*	-0.034	-0.018	-0.032	-0.004
	(0.0535)	(0.0687)	(0.0564)	(0.0448)	(0.0536)	(0.0590)
Simple_average3_mfn	-0.012	-0.018	-0.006	-0.009	-0.010	-0.006
	(0.00875)	(0.0113)	(0.00959)	(0.00735)	(0.0120)	(0.0090)
l_gfcf1	0.382***	0.193	0.475***	0.440***	0.293**	0.496***
	(0.0903)	(0.125)	(0.129)	(0.129)	(0.140)	(0.153)
l_reer	-1.173***	-0.933***	-1.271***	-1.169***	-1.018***	-1.199***
	(0.202)	(0.284)	(0.308)	(0.188)	(0.231)	(0.314)
l_gov_spending_imf	**-0.070**	**-0.050**	**-0.093**			
	(0.0811)	**(0.0773)**	**(0.0949)**			
l_gov_revenue_imf				**-0.070**	**-0.065**	**-0.074**
				(0.135)	**(0.140)**	**(0.195)**
Constant	-9.637***	-12.360**	-8.383***	-9.097***	-11.40***	-8.201***
	(1.547)	(1.599)	(1.914)	(1.309)	(1.241)	(2.153)
Observations	56	57	56	57	58	57
R-squared	0.958	0.954	0.856	0.929	0.951	0.812
Trade variable in growth estimate	0.539**	0.678***	0.497***	0.018	0.022	0.018
	(0.215)	(0.227)	(0.243)	(0.193)	(0.220)	(0.189)

Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Authors' calculations.

Table A5.3. Landlocked countries – Alternative road variables

	Road quantity			Road quality			Road quantity and quality		
	Openness	**Exports**	**Imports**	**Openness**	**Exports**	**Imports**	**Openness**	**Exports**	**Impc**
Loggdp1	-0.017	-0.044	-0.009	-0.031	-0.021	-0.043	-0.0002	-0.026	0.014
	(0.0242)	(0.0274)	(0.0332)	(0.0229)	(0.0165)	(0.034)	(0.0205)	(0.0216)	(0.0285)
l_roadkm2	**0.006**	**-0.020**	**0.032**				**0.105*****	**0.084****	**0.167*****
	(0.0156)	**(0.0227)**	**(0.0242)**				**(0.0326)**	**(0.0381)**	**(0.0383)**
l_roadpaved				**-0.013**	**-0.090*****	**0.027**	**-0.196*****	**-0.207*****	**-0.268*****
				(0.0186)	**(0.0193)**	**(0.0289)**	**(0.0491)**	**(0.0522)**	**(0.0532)**
l_electric_cons_percap	0.166***	0.383***	0.036	0.204***	0.394***	0.098***	0.198***	0.417***	0.080**
	(0.0169)	(0.0264)	(0.0310)	(0.0173)	(0.0172)	(0.0314)	(0.0210)	(0.0269)	(0.0359)
l_dom_credit	-0.061	-0.077	-0.053	-0.059*	-0.075**	-0.048	-0.056*	-0.071*	-0.046
	(0.0392)	(0.0467)	(0.0514)	(0.0331)	(0.0307)	(0.0485)	(0.0314)	(0.0406)	(0.0339)
Simple_average3_mfn	-0.021***	-0.017*	-0.025***	-0.013**	-0.014**	-0.012	-0.015***	-0.010	-0.017*
	(0.00517)	(0.00873)	(0.00832)	(0.00535)	(0.00573)	(0.00865)	(0.00540)	(0.00844)	(0.00867)
l_gfcf1	0.363***	0.201*	0.400***	0.355***	0.259***	0.378***	0.457***	0.301***	0.529***
	(0.0745)	(0.103)	(0.112)	(0.0677)	(0.0677)	(0.111)	(0.0707)	(0.0841)	(0.110)
l_reer	-1.003***	-0.948***	-0.950***	-0.896***	-0.965***	-0.790***	-0.943***	-0.883***	-0.868***
	(0.129)	(0.222)	(0.223)	(0.147)	(0.150)	(0.240)	(0.122)	(0.205)	(0.221)
Constant	-11.11***	-12.77***	-11.14***	-11.60***	-13.02***	-11.96***	-10.72***	-12.37***	-10.60***
	(0.743)	(0.971)	(1.127)	(0.839)	(0.839)	(1.342)	(0.763)	(1.009)	(1.062)
Observations	66	67	66	74	75	74	66	67	66
R-squared	0.889	0.935	0.687	0.876	0.944	0.612	0.921	0.949	0.778
Trade variable in growth estimate	0.092	0.093	0.097	0.222	0.201	0.251	0.165	0.174	0.179
	(0.204)	(0.215)	(0.220)	(0.189)	(0.170)	(0.229)	(0.192)	(0.198)	(0.218)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Appendix 6.

Alternative regressions for small and vulnerable economies

Table A6.1. Small and Vulnerable economies – Alternative transport variable

	Openness	Exports	Imports
Loggdp1	-0.125	-0.057	-0.176
	(0.148)	(0.188)	(0.138)
l_roadkm2	**0.177***	**0.108**	**0.223***
	(0.0896)	**(0.106)**	**(0.0820)**
l_electric_cons_percap	0.076	0.086	0.057
	(0.105)	(0.125)	(0.105)
l_dom_credit	0.444**	0.450**	0.428***
	(0.177)	(0.221)	(0.155)
Simple_average3_mfn	0.0160	0.0238	0.0105
	(0.0289)	(0.0327)	(0.0264)
l_gfcf1	0.278	0.163	0.357
	(0.324)	(0.373)	(0.307)
l_property_rights	0.114	0.557**	-0.048
	(0.169)	(0.215)	(0.162)
l_l_force	0.478	0.496	0.519*
	(0.341)	(0.415)	(0.311)
l_reer	-0.848	-1.007	-0.583
	(0.613)	(0.753)	(0.560)
l_government_spending	-2.956***	-3.052**	-2.907***
	(1.103)	(1.311)	(0.990)
l_Herfindhal	-1.105**	-0.944*	-1.259**
	(0.424)	(0.478)	(0.488)
Constant	-5.500	-8.961	-6.163
	(4.316)	(5.786)	(3.833)
Observations	121	121	122
R-squared	0.369	0.314	0.408
Trade variable in growth estimate	0.092**	0.099*	0.087**
	(0.0417)	(0.0542)	(0.0362)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Table A6.2: Small and Vulnerable economies – Alternative electricity variable

	Openness	Exports	Imports
Loggdp1	-0.033	-0.080	-0.031
	(0.111)	(0.183)	(0.0890)
l_road_paved	0.499	0.374	0.543*
	(0.323)	(0.384)	(0.290)
l_electric_power_losses_p_out	**-0.424****	**-0.692****	**-0.319***
	(0.206)	**(0.281)**	**(0.176)**
l_dom_credit	0.159	0.0579	0.189
	(0.189)	(0.228)	(0.165)
Simple_average3_mfn	-0.005	-0.005	-0.005
	(0.0208)	(0.0266)	(0.0183)
l_gfcf1	0.486*	0.562	0.474*
	(0.288)	(0.342)	(0.268)
l_property_rights	0.0631	0.521*	-0.135
	(0.201)	(0.268)	(0.181)
l_l_force	0.199	0.349	0.156
	(0.229)	(0.287)	(0.208)
l_reer	-0.858	-1.143	-0.608
	(0.685)	(0.891)	(0.610)
l_government_spending	-1.378	-0.884	-1.560
	(1.217)	(1.466)	(1.099)
l_Herfindhal	-1.119*	-1.078	-1.179*
	(0.620)	(0.656)	(0.663)
Constant	-11.29***	-14.15**	-11.39***
	(3.818)	(5.899)	(3.192)
Observations	87	87	88
R-squared	0.359	0.347	0.390
Trade variable in growth estimate 1/	0.021	-0.010	0.025
	(0.336)	(0.0435)	(0.0311)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

1. This impact is fragile. Small changes in specification of the growth result in large variations.

Source: Authors' calculations

Table A6.3. Small and Vulnerable economies – Telecommunication infrastructure

	Openness	Exports	Imports
Loggdp1	-0.218*	-0.313*	-0.177
	(0.128)	(0.173)	(0.114)
l_road_paved	0.515***	0.459**	0.549***
	(0.162)	(0.186)	(0.150)
tel100pop	**0.0226***	**0.0425***	**0.0131**
	(0.0118)	**(0.0152)**	**(0.0106)**
l_electric_cons_percap	-0.0209	-0.0181	-0.0429
	(0.0877)	(0.109)	(0.0904)
l_dom_credit	0.341**	0.329	0.332**
	(0.155)	(0.200)	(0.134)
Simple_average3_mfn	-0.00308	-0.00169	-0.00423
	(0.0247)	(0.0287)	(0.0223)
l_gfcf1	0.216	0.178	0.250
	(0.310)	(0.358)	(0.297)
l_property_rights	0.159	0.646***	-0.0313
	(0.168)	(0.219)	(0.161)
l_l_force	0.429**	0.766***	0.282
	(0.201)	(0.258)	(0.183)
l_reer	-0.955*	-0.948	-0.810
	(0.566)	(0.720)	(0.512)
l_government_spending	-2.490***	-2.875***	-2.274***
	(0.799)	(0.957)	(0.724)
l_Herfindhal	-1.116***	-0.856*	-1.333***
	(0.414)	(0.468)	(0.480)
Constant	-6.326*	-9.617*	-6.894**
	(3.751)	(5.135)	(3.347)
Observations	123	123	124
R-squared	0.402	0.340	0.443
Trade variable in growth estimate	0.060*	0.066*	0.058**
	(0.0305)	(0.0374)	(0.0278)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations.

Appendix 7.

Alternative regressions for commodity exporters

Table A7.1. Commodity exporters – Alternative import tariffs variable

	Openness	Exports	Imports
Loggdp1	-0.101***	-0.109**	-0.107**
	(0.0262)	(0.0408)	(0.0420)
l_road_paved	0.012	-0.110*	0.100*
	(0.0334)	(0.0564)	(0.0536)
l_electric_cons_percap	0.064	0.034***	-0.097***
	(0.0415)	(0.0617)	(0.0579)
l_dom_credit	-0.155**	-0.533***	-0.017
	(0.0644)	(0.108)	(0.0787)
Simple_average1_AHS	**-0.048***	**-0.043***	**-0.048***
	(0.00548)	**(0.0139)**	**(0.0093)**
l_gfcf1	0.127	-0.095	0.355***
	(0.0863)	(0.126)	(0.128)
l_reer	-0.596***	-1.127***	-0.245
	(0.156)	(0.288)	(0.212)
l_government_spending	0.132	0.527***	-0.112
	(0.151)	(0.173)	(0.201)
l_herfindahl	0.673***	1.134***	0.117
	(0.132)	(0.179)	(0.116)
Constant	-8.588***	-7.295***	-11.12***
	(0.653)	(1.127)	(1.136)
Observations	51	51	51
R-squared	0.860	0.862	0.800
Trade variable in growth estimate	0.096	0.051	0.234
	(0.115)	(0.0614)	(0.334)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Table A7.2. Commodity exporters – Alternative electricity variable

	Openness	Reliability Exports	Imports	Availability (Core results) Openness	Exports	Imports
loggdp1	-0.056** (0.0243)	0.097** (0.0454)	-0.137*** (0.0257)	-0.128*** (0.0196)	-0.166*** (0.0289)	-0.143*** (0.0243)
l_road_paved	0.087 (0.0534)	0.068 (0.104)	0.089** (0.0434)	-0.044 (0.0263)	-0.141*** (0.0375)	0.018 (0.0319)
l_electric_power_losses_p_out	**-0.071** **(0.0936)**	**-0.080** **(0.174)**	**-0.096** **(0.0833)**			
l_electric_cons_percap				**0.163*** (0.0215)**	**0.400*** (0.0275)**	**0.025** **(0.0240)**
l_dom_credit	-0.082 (0.0573)	-0.238** (0.108)	-0.019 (0.0443)	-0.085** (0.0391)	-0.355*** (0.0711)	0.0431 (0.0400)
Simple_average3_mfn	-0.045*** (0.00904)	-0.061*** (0.0144)	-0.033*** (0.00717)	-0.025*** (0.00422)	-0.023*** (0.00623)	-0.023*** (0.00476)
l_gfcf1	0.425*** (0.110)	0.277 (0.277)	0.637*** (0.0924)	0.279*** (0.0631)	0.108 (0.0990)	0.464*** (0.0753)
l_reer	-0.536** (0.264)	-0.712 (0.507)	-0.465* (0.254)	-0.656*** (0.162)	-0.864*** (0.297)	-0.460*** (0.170)
l_government_spending	-0.182 (0.166)	-0.227 (0.404)	-0.308* (0.156)	0.002 (0.101)	0.355*** (0.123)	-0.243** (0.118)
l_herfindahl	0.774*** (0.149)	1.310*** (0.296)	0.122 (0.125)	0.590*** (0.0843)	1.203*** (0.0979)	-0.004 (0.0906)
Constant	-9.213*** (1.102)	-10.620*** (2.337)	-9.748*** (0.926)	-8.693*** (0.684)	-9.204*** (1.339)	-10.14*** (0.705)
Observations	67	68	68	99	100	100
R-squared	0.694	0.539	0.800	0.830	0.843	0.787
Trade variable in growth estimate	0.009 (0.115)	0.006 (0.155)	0.012 (0.134)	0.011 (0.102)	0.011 (0.077)	0.020 (0.148)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Table A7.3. Commodity exporters – Adding telecommunication variable to the core results

	Openness	Exports	Imports
Loggdp1	-0.128***	-0.116***	-0.144***
	(0.0197)	(0.0290)	(0.0242)
l_road_paved	-0.044	-0.141***	0.018
	(0.0265)	(0.0376)	(0.0324)
l_electric_cons_percap	0.162***	0.405***	0.004
	(0.0317)	(0.0469)	(0.0346)
l_dom_credit	-0.086**	-0.353***	0.036
	(0.0406)	(0.0745)	(0.0394)
Simple_average3_mfn	-0.025***	-0.023***	-0.023***
	(0.00425)	(0.00620)	(0.00476)
l_gfcf1	0.278***	0.112	0.446***
	(0.0672)	(0.111)	(0.0731)
l_reer	-0.657***	-0.861***	-0.474***
	(0.162)	(0.299)	(0.175)
l_government_spending	0.001	0.357***	-0.252**
	(0.104)	(0.123)	(0.122)
l_herfindahl	0.590***	1.201***	0.003
	(0.0871)	(0.103)	(0.0959)
l_teldensity	**0.002**	**-0.006**	**0.027**
	(0.0272)	**(0.0389)**	**(0.0300)**
Constant	-8.671***	-9.271***	-9.854***
	(0.762)	(1.467)	(0.785)
Observations	99	100	100
R-squared	0.830	0.843	0.789
Trade variable in growth estimate	0.044	0.035	0.065
	(0.0925)	(0.0714)	(0.132)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations.

Appendix 8.

Main Business Constraints According To Firms Surveys

	Main Constraint (Ranked first)				Top 3 constraints (Ranked first to third main constraints)			
	Description	Number of Countries	Share in percent of possibilities	Percent of firms 2/	Description	Number of Countries	Share in percent of possibilities 1/	Percent of firms 2/
All ODA recipients 96 Countries	Electricity	28	29.2	39.6	Access to Finance	65	67.7	19.7
	Access to Finance	23	24.0	26.8	Electricity	45	46.9	30.4
	Informal sector	14	14.6	24.0	Informal sector	40	41.7	18.4
	Political instability	11	11.5	33.1	Tax rates	35	36.5	17.4
	Tax rates	9	9.4	24.7	Political instability	27	28.1	21.6
	Inadequately educated wo	4	4.2	29.2	Corruption	22	22.9	13.9
	Crime, theft and disorder	4	4.2	28.4	Crime, theft and disorder	19	19.8	17.5
	Licences and permits	2	2.1	27.0	Inadequately educated workforce	14	14.6	17.4
	Corruption	1	1.0	14.2	Transportation	6	6.3	11.6
					Access to land	5	5.2	13.1
					Licences and permits	4	4.2	20.9
					Tax Administration	3	3.1	15.7
					Labor regulations	3	3.1	8.9
Landlocked 30 countries	Access to Finance	9	30.0	26.1	Access to Finance	23	76.7	21.5
	Electricity	6	20.0	36.0	Tax rates	16	53.3	19.9
	Tax rates	5	16.7	26.3	Informal sector	14	46.7	18.8
	Informal sector	5	16.7	25.1	Electricity	9	30.0	31.6
	Political instability	4	13.3	35.6	Political instability	8	26.7	24.5
	Crime, theft and disorder	1	3.3	20.0	Corruption	6	20.0	14.1
					Inadequately educated workforce	6	20.0	12.7
					Crime, theft and disorder	3	10.0	16.5
					Access to land	2	6.7	13.5
					Licences and permits	1	3.3	14.6
					Transportation	1	3.3	11.4
					Labor regulation	1	3.3	2.6
SVEs 35 countries	Electricity	11	31.4	35.4	Access to Finance	24	68.6	20.2
	Access to Finance	10	28.6	26.9	Informal sector	18	51.4	18.0
	Informal sector	6	17.1	22.5	Electricity	17	48.6	27.9
	Political Instability	5	14.3	31.7	Political Instability	11	31.4	22.4
	Tax rates	2	5.7	17.8	Tax rates	10	28.6	16.4
	Licences and permits	1	2.9	25.4	Corruption	10	28.6	13.4
					Crime, theft and disorder	5	14.3	14.8
					Inadequately educated workforce	3	8.6	11.7
					Transportation	2	5.7	13.0
					Access to land	2	5.7	10.7
					Licences and permits	1	2.9	25.4
					Tax Administration	1	2.9	11.3
					Labor regulation	1	2.9	8.8
Commodity Exporters 48 countries	Electricity	16	20.8	38.9	Access to Finance	35	12.5	22.7
	Access to Finance	12	15.6	26.4	Electricity	25	9.0	30.6
	Informal sector	6	7.8	27.5	Tax rates	18	6.5	18.3
	Political instability	4	5.2	26.1	Informal sector	16	5.7	19.4
	Tax rates	4	5.2	26.0	Corruption	14	5.0	15.4
	Inadequately educated wo	2	2.6	27.2	Political instability	10	3.6	18.2
	Crime, theft and disorder	2	2.6	20.8	Crime, theft and disorder	9	3.2	17.1
	Licences and permits	1	1.3	28.7	Inadequately educated workforce	6	2.2	17.2
	Corruption	1	1.3	14.2	Access to land	5	1.8	15.9
					Transportation	5	1.8	11.3
					Licences and permits	1	0.4	28.7
Islands 10 countries	Electricity	3	30.0	23.6	Electricity	6	60.0	18.2
	Informal sector	3	30.0	21.2	Informal sector	6	60.0	18.5
	Political instability	1	10.0	8.8	Crime, theft and disorder	5	50.0	12.6
	Inadequately educated wo	1	10.0	25.2	Access to Finance	5	50.0	17.0
	Access to Finance	1	10.0	30.2	Tax rates	3	30.0	15.2
	Tax rates	1	10.0	17.0	Political instability	1	10.0	44.4
					Labor regulation	1	10.0	8.8
					Inadequately educated workforce	1	10.0	25.2
					Transportation	1	10.0	12.6
					Corruption	1	10.0	17.0

Data are the latest available for each country in September 2010.
1. 100% if mentioned by all countries in the top three constraints.
2. Simple average.

Source: Author's calculation based on the *Enterprise Surveys* (World Bank, 2010).